VOLUME 41
NUMBER 4

APRIL, 1954

plating

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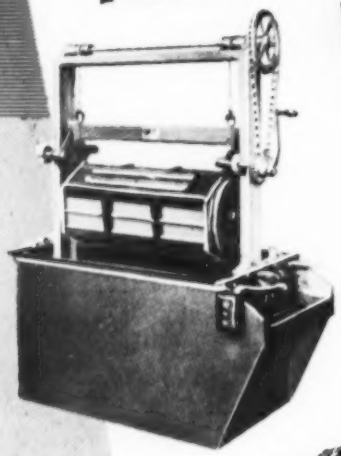

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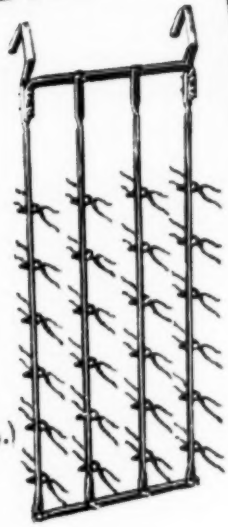

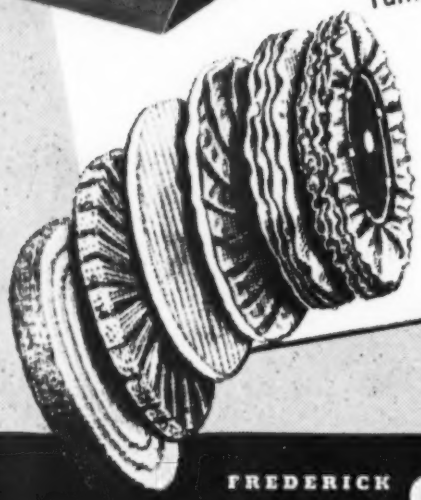

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In This Issue

Current Density Distribution in Electroplating by Use of Models by Gilbert F. Kinney and John V. Festa. An electroplated metal is deposited as a result of the electric field set up in the plating bath. Control of the field is essential if a uniform electroplate is to be obtained. This paper describes a method of utilizing models in the study of these electric fields. Measurements of relative current density thereby are made readily for a variety of practical electroplating situations. These measurements give the primary current distribution which would be observed if polarization and anode and cathode surface phenomena are not taken into account. Two references and 10 figures complete the paper.

Tentative Recommended Practice for Preparation of Copper and Copper-base Alloys for Electroplating. This practice, under the ASTM designation B281–53T is the latest one from this group directly related to electrodeposited coatings and should be of interest to readers of this journal. It is not intended as a standardized procedure and should be used merely as a guide. The practice details the following: preparation of surface; solution maintenance and cleaning; spotting out, safety precautions; outlines of preparatory cycles for buffed work, bright dipped or pickled work and work to be barrel plated; outlines of preparatory operations for cleaning, tarnish and stain removal and neutralization, and striking. Formulas for 5 acid pickling solutions and an electropolishing bath are given in an appendix.

Metal Reflector Finishing by Earl B. Heyer. First surface mirrors are used in many optical instruments and generally are made of aluminized glass. In some precision applications, reflectors of metal are preferred because of their optical stability at higher temperatures and their superior resistance to thermal shock. This paper tells of the miscellaneous finishing operations that are observed in the rhodium plating of metal reflectors for use in motion picture projection arc service.

Cleaning and Preparation of Metals for Electroplating. VIII. Effect of Oxide Films—A Survey of the Literature by Henry B. Linford and David O. Feder. This is the concluding installment of a report from AES Research Project No. 12, part one of which appeared in the March, 1954 issue.

For page numbers, see Table of Contents, page 377

Published monthly at 5800 N. Marvine St., Philadelphia 41, Pa. Entered as second class matter July 1, 1946, at the Post Office at Philadelphia, Pa., under Act of August 24, 1916. Subscriptions: Domestic and Canada, $4.00 for 1 year, $7.00 for 2 years 50c per copy; Foreign, $8.00 per year, $1.00 per copy.

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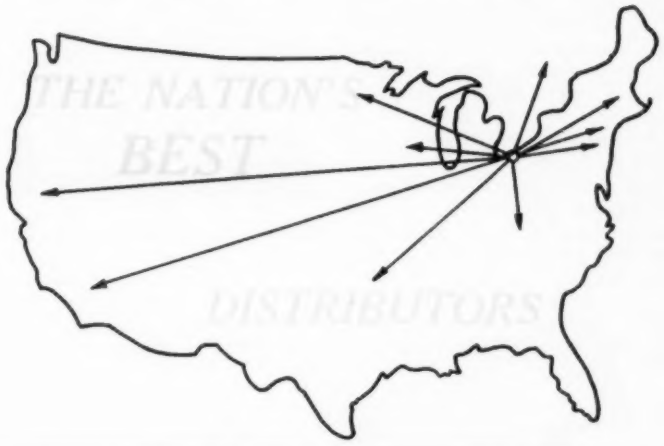

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Industry News

Oakite President Addresses Division Managers. A steady increase in the sales of industrial cleaning and metal-treating compounds during the coming years was forecast by John A. Carter, president of Oakite Products, Inc., in a talk before the company's division managers at their annual conference in New York's Hotel Roosevelt.

Reviewing the history of the company, Carter pointed out that Oakite is continuing its program of expanding its present field service staff of more than 215 men, and that the company's research and service laboratories will move to larger, more modern quarters at 350 Hudson St., New York City, about April 1.

Harshaw Chicago Office Moving To New Quarters. The Chicago branch office of The Harshaw Chemical Co. has moved into its new building located at 1925 S. California Ave.

The modern single story structure with a gross area of 26,000 square feet has been under construction since last October. It houses sales office, warehouse stocks and a completely equipped laboratory to service the company's new Perglow and Nubrite nickel plating processes recently introduced to the trade.

F. L. Hintze, formerly Harshaw's Manager in the Cincinnati district and until recently assistant sales manager at the company's main office in Cleveland, is in charge.

New Division of Lea Mfg. Co. Name Change. Dee F. Mosher, Vice-President of Lea-Michigan, Inc., Detroit, Mich., announces their new company name,

Mosher

which formerly was Lea Mfg. Co. of Michigan, Inc. Lea-Michigan, an affiliate of The Lea Mfg. Co., of Waterbury, Conn., manufactures Lea Gripmaster polishing wheel cements, Lea Liquabrade—liquid buffing compositions—and other related Lea surface finishing products and processes for the buffing, polishing and plating industry.

Chemical Products Corp. Opens Western Office. The Chemical Products Corp. of E. Providence, R. I., announces the opening of a new sales office and warehouse in Los Angeles, Calif. All sales and services of Chemical Products Corporation's Chem-O-Sol plastisol formulation, as well as lacquers and decora-

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Still More Sustaining Memberships

The Chicago Branch, AES reported three and the Detroit Branch swelled the listing with two additional sustaining memberships to be added to the ranks of AES Research Program supporters. The newest organizations covered by these reports are:

Big Ben Petroleum Products Co.
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General American Transportation Corp., Kanigen Division,
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Industrial Stamping & Mfg. Co., Division of Vinco Corp.
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S-86

Industry News

tive finishes for plastics in the West Coast area, will be handled by A. J. Caron of 1119 W. 36th St., Los Angeles.

Caron was formerly a sales engineer for the Parts Engineering Co., previous representatives of the Chemical Products Corporation on the West Coast.

ARco Opens Ohio Region Office. Consistent with the ARco general expansion program in production and sales facilities, Automotive Rubber Co., Inc., of Detroit, Mich., and Houston, Texas, recently announced the opening of their new Cleveland sales office.

The Cleveland office will be headed by B. C. (Bernie) Mulheran. After 11 years of sales engineering experience in the corrosion-resistant materials field, Mulheran joined the ARco organization recently to assume the post of Ohio manager. His technical background and broad, practical experience enable Mulheran to offer outstanding protective coating application facilities.

Mulheran

ARco now offers the broad services of three modern plants along with new mill room facilities, all opened in 1953. The Automotive Rubber Company organization consults, engineers, fabricates, and completely installs corrosion-resistant equipment. General offices are located at 12550 Beech Rd., Detroit 28, Mich.

Chandeysson Distributors' Meeting. A distributors' meeting was held at the Chandeysson Electric Co., in their St. Louis, Mo., plant to inaugurate the 50th anniversary year celebration.

Engineering, manufacturing and marketing, as well as a thorough shop and factory course were presented and implemented.

Also on this occasion, an oil painting of Dr. Chandeysson, presented by the employees and officers, was officially unveiled.

Free Five-Year Scholarships For Northwestern University. In continuance of a program started two years ago, the Belke Mfg. Co. has again granted 2 full-tuition 5-year scholarships for the Northwestern University Technological Institute, available to students entering this fall.

Granted for the purpose of training better qualified men for the electroplating and metal finishing industry, the Belke scholarships are of the cooperative type in which the student alternates college work periods with work periods in industry through a 5-year program. At completion of the course, the student receives the degree of Bachelor of Science in Engineering.

Upon enrollment students attend college 1½ years, then alternate 12-week periods in college and 12-week periods in

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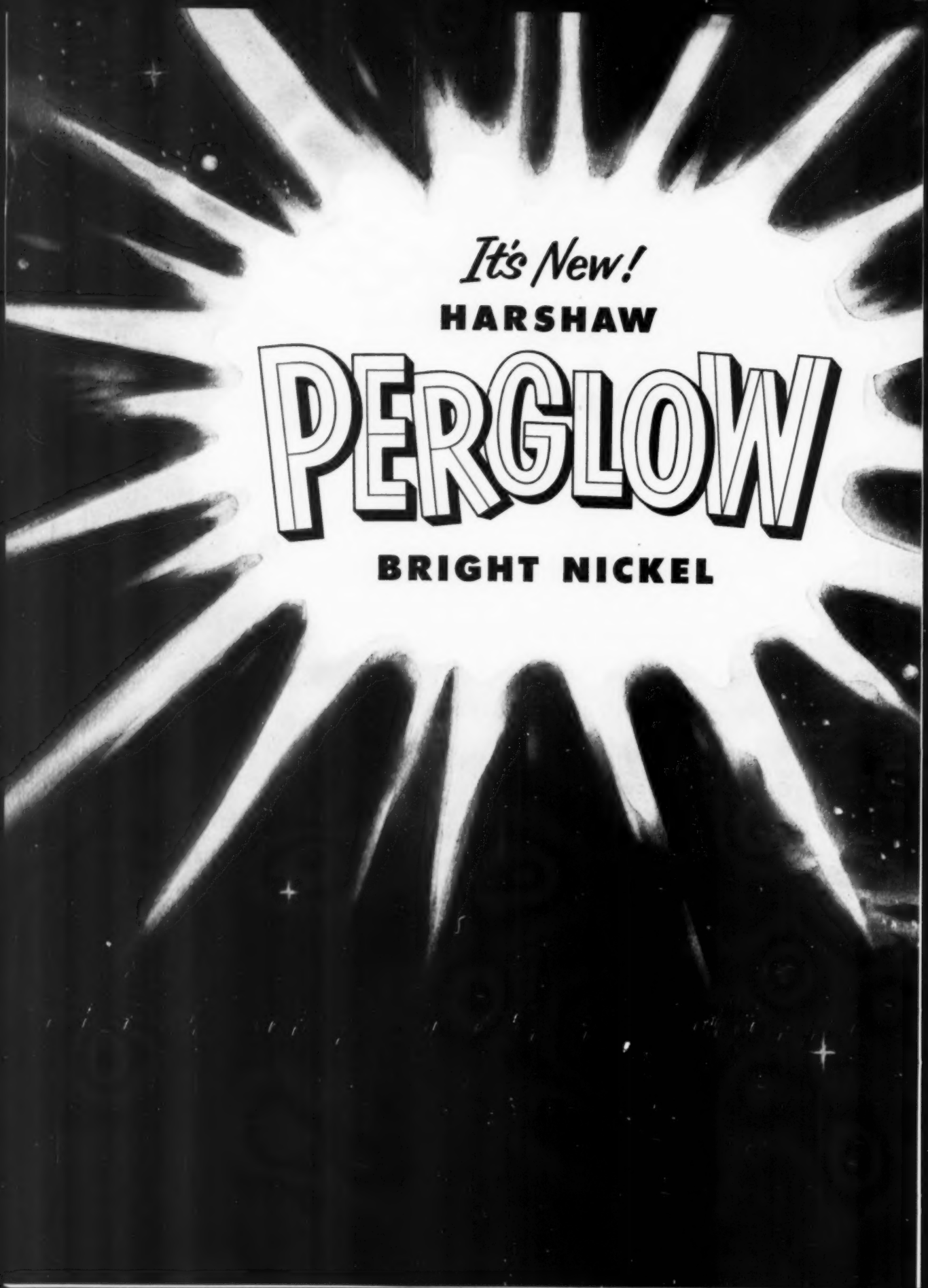
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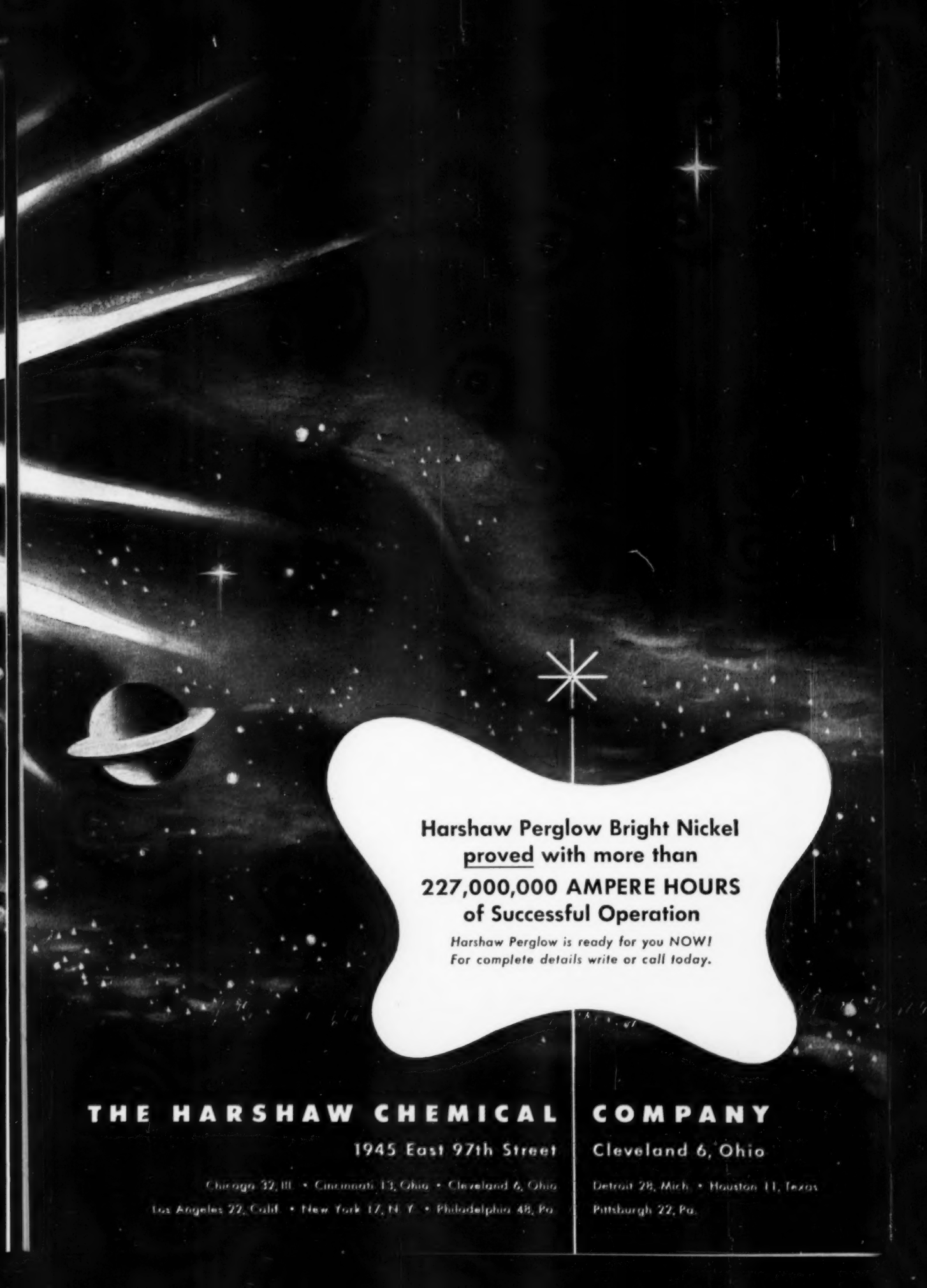
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industry. Subjects include mathematics, chemistry, physics, metallurgy and engineering. Industrial work consists of actual employment at the prevailing wage in plants such as the Belke Mfg. Co., other manufacturers of plating and metal finishing equipment, and in metal finishing shops or metal finishing departments of manufacturers.

In addition to providing practical contact with various metal finishing processes, the industrial work periods enable the student to be nearly self-supporting.

Admission requirements include average high school grades in the upper quarter of the class, with 3½ units of high school math.

Further information will be supplied promptly on request to Raymond W. Kotz, Belke Mfg. Co., 947 N. Cicero Ave., Chicago 51, Ill.

Norton Exhibit at ASTE Exposition. Live demonstrations of tool grinding and barrel finishing will be featured at the Norton Co. exhibit in booth 1430 at the American Society of Tool Engineers Exposition to be held April 26–30 in Philadelphia's Convention Hall.

The Norton exhibit will also include diamond wheels, Crystolon K Bond wheels for carbide grinding, Crystolon "Hot Rod" heating elements, Norbide dressing sticks, and refractory shapes for heat-treating furnaces.

Actual work will be finished in a tumbling barrel at the booth to demonstrate graphically the action which takes place within the barrel.

Chicago Electroplaters' Institute Elections. The Chicago Electroplaters' Institute has elected Charles N. Jensen, President, Jensen Plating Works, as Chairman to succeed Lawrence J. Hay, Plating Service Co. Also elected were Robert L. Giesel, President, Adolph Plating Inc., who succeeds Jensen as Vice-Chairman, and John Lietz, B. Mercil & Sons Plating Co., succeeding Giesel as Secretary-Treasurer.

Jensen Giesel

Elected to the Board of Directors for 2-year terms were retiring Chairman Hay; C. J. Kennedy, American Buffing & Processing Co.; Harold W. Baker, Electro Galvanizing Co.; and Fred Wahlen, Mechanical Plating Co.

The Chicago Electroplaters' Institute is an association of 101 job-shop plating plants in the Chicago area.

A New Home Study Course: The Joseph B. Kushner Electroplating School announces a new short home-reading course on Water and Waste Control for the Plating Shop.

The course is intended for platers, metal finishing executives, chemists and engineers who are faced or will be faced with the necessity of curbing or abating the nuisance of plating and metal finishing wastes, in order to comply with local sewer authority codes and state water pollution laws.

The course covers every phase of water and waste treatment, taking up in detail methods for minimizing plating wastes and methods for reducing the cost of waste treatment to the lowest possible figure. Various techniques for treating and recovering plating wastes are compared as to cost and efficiency and many examples are given so that the reader can determine which waste recovery treatment is best suited for his own particular needs. It is shown how the need for costly waste treatment plants can be entirely eliminated, how some can be made to pay for themselves, how the operation cost for those already in existence can be greatly reduced.

While there is little mathematics in the body of the course material, there is an engineering appendix containing an extremely comprehensive table of design, rinsing and recovery formulas and nomographs of proven practical value, many of which appear for the first time. Those interested in the course are invited to write to the Joseph B. Kushner Electroplating School, 115 Broad St., Stroudsburg, Pa., for further details.

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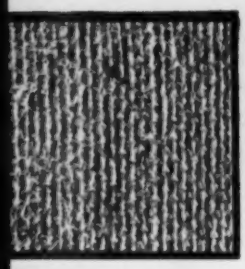

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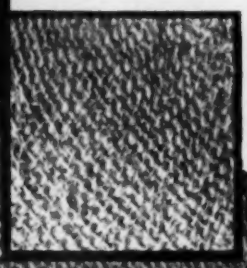

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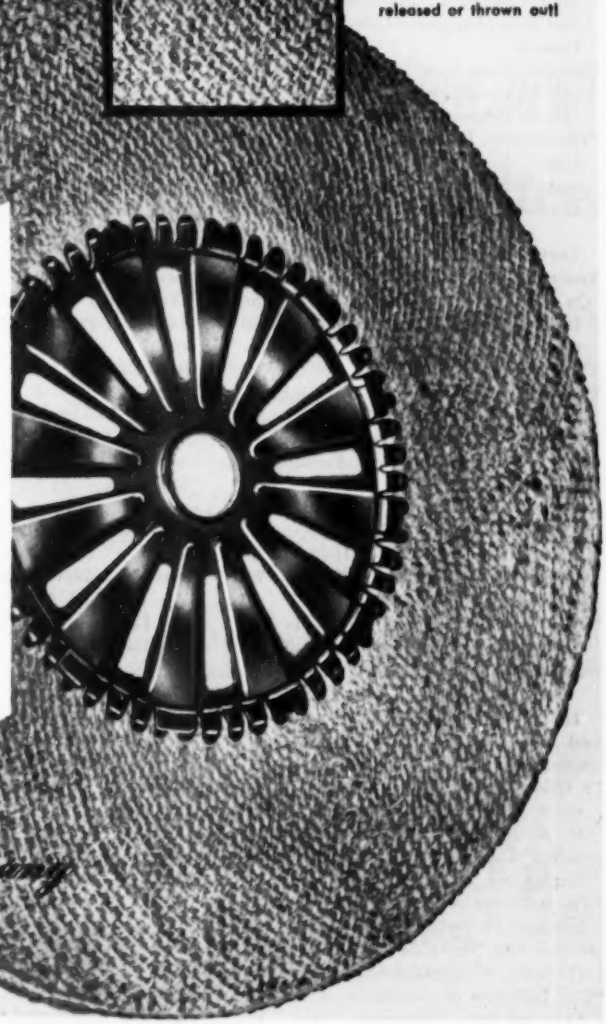

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Intersociety News

International Electrodeposition Conference Program

The program of Technical Sessions for the 4th International Conference on Electrodeposition and Metal Finishing to be held in London, England on April 20–24, 1954 has been announced as follows:

April 21, 1954

Technical Session 1, Anodic Processes; Chairman: J. W. Cuthbertson.

"The Scientific Basis of the Anodic Oxidation of Aluminum and Its Alloys," by P. Lacombe (Ecole Superieure des Mines, Paris, France)

"Recent Developments in Industrial Methods of Anodic Brightening and Anodic Oxidation of Aluminum and Its Alloys," by J. Herenguel (Paris, France)

"Phosphoric Acid Anodizing of Aluminum," by R. C. Spooner and D. P. Seraphim (Aluminum Laboratories Ltd., Canada)

"On the Electrolytic Polishing of Metals in Phosphoric Acid," by L. Meunier (Mons, Belgium)

"Electrolytic Polishing and Metal Fatigue," by R. Moudon (Jacquet Hispano-Suiza, Paris, France), H. Zentler-Gordon (Consultant, London)

Technical Session 2A, Fundamental Aspects; Chairman: T. P. Hoar.

"On the Experimental Methods for the Determination of Electrode Polarization," by R. Piontelli, Politecnica, Milan, Italy)

"Radiotracer Study of the Electrochemical Displacement of Metals," by M. Simnad, A. Spilners and Ling Yang (Carnegie Institute of Technology, Pittsburgh, Pa.)

"Morphology of the Growth of Isolated Crystals in Cathodic Metal Deposits," by H. Fischer and H. F. Heiling (Siemens und Halske Aktiengesellschaft, W. Germany)

"Corrosion or Protection at Gaps in Metallic Coatings," by U. R. Evans (Cambridge University)

Technical Session 2B, Chromium and Tin Coatings; Chairman: G. E. Gardam.

"A Quantitative Adhesion Test for Chromium Deposits," by C. Williams and R. A. F. Hammond (Armament Research Establishment, Fort Halstead, England)

"The Influence of Annealing on the Structure and Properties of Electrodeposited Chromium," by C. P. Brittain and G. C. Smith (Cambridge University)

"The Diffusion of Chromium and Other Elements Into Nonferrous Metals," by R. L. Samuel and N. A. Lockington (Diffusion Alloys, Ltd., London, England)

"Recent Advances in the Manufacture of Tinplate," by W. E. Hoare (Tin Research Institute, England)

April 22, 1954

Technical Session 3, Nickel Plating; Chairman: Dr. W. R. Meyer.

"The Prevention of Cracking in Nickel Electrodeposits," by T. E. Such (Wilmot-Breeden, Ltd., England)

"Studies in the Action of Organic Compounds at the Surface During the Electrodeposition of Nickel," by H. Leidheiser, Jr. (Virginia Institute for Scientific Research, U. S. A.)

"Bright Nickel Plating," by R. B. Saltonstall (Udylite Corporation, Detroit, Mich.)

"Nickel Plating from the Sulfamate Solution," by M. B. Diggin (Hanson-Van Winkle-Munning Co., Matawan, N. J.)

"The Weathering of Nickel/Chromium Electrodeposits," by W. A. Wesley and B. B. Knapp (International Nickel Co., New York, N. Y.)

"Notes on Cleaning Cycles for Plating," by A. K. Graham (Graham, Crowley and Associates, Inc., Jenkintown, Pa.)

April 23, 1954

Technical Session 4, American Electroplating Practice; Chairman: S. Wernick.

"Bright Plating With Metals Other Than Nickel," by R. B. Saltonstall

"Electropolishing and Bright Pickling," by C. L. Faust (Battelle Memorial Institute, Columbus, Ohio)

"Metal Finishing Equipment," by M. B. Diggin

"Cleaning and Preparation of Metals for Plating," by W. R. Meyer (Enthone, Inc., New Haven, Conn.)

"The Practical Aspects of Plating," by W. L. Pinner, Houdaille-Hershey Corp., Detroit, Mich.)

Technical Session 5A, Organic Finishing; Chairman: A. A. B. Harvey.

"Automotive Body Finishing," by J. T. O'Reilly (Ford Motor Co., Detroit, Mich.)

"Infrared Stove-Drying of Paints," by Peugeot, France

"A New Type of Primer for Resistance Welding," by A. J. Elleman and N. D. P. Smith (Imperial Chemical Industries Ltd., Paints Division, England)

"Organic Finishes on Electrodeposited Coatings with Special Reference to Adhesion," by E. C. J. Marsh (Standard Telephones and Cables Ltd., U. K.)

Technical Session 5B, Electrodeposition; Chairman: Dr. W. Blum.

"Tin-Alloy Plating: American Experience," by F. A. Lowenheim (Metal & Thermit Corp., Carteret, N. J.).

"Progress in Tin-Nickel Alloy Plating," by A. E. Davies (Tin Research Institute, U. K.)

"The Electrodeposition of Gold and Other Alloys by a New Method," by G. E. Gardam (Aluminum Laboratories Ltd., U. K.) and N. E. Tidswell (Design & Research Centre for Gold, Silver and Jewelry Industries, U. K.)

"The Resistance of Some Cast and Plated Sleeve Bearing Materials to Cavitation Erosion," by R. A. Schaefer, J. F. Cerness and H. A. Thomas (Clevite-Brush Development Co., Cleveland, Ohio)

"A Laboratory Technique for the Deposition of Manganese on Other Metals," by Winifred A. Bell (Fulmer Research Institute, U. K.)

April 24, 1954

Technical Session 6, The Future; Chairman: A. W. Wallbank.

"Unsolved Problems in the Metal Finishing Industry," by W. L. Pinner.

"Universal Metal Finishing Problems," by S. Wernick.

"Glass-Fibre Reinforced Plastics: A New Material of Construction for the Finishing Industry," by H. Silman (Ford Research Centre, U. K.).

"The Electrodeposition of Porous Metals," by C. L. Faust.

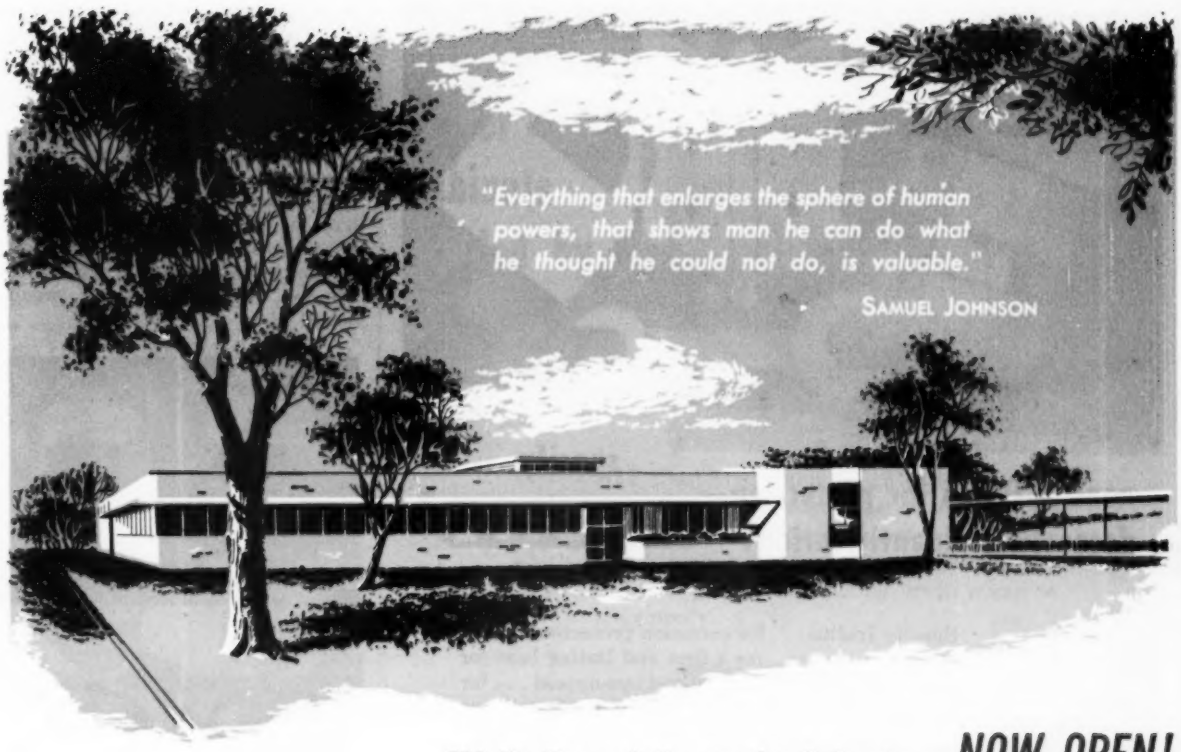
The Electrochemical Society

May 2–6, 1954 have been selected as the dates for the spring meeting of the Electrochemical Society. The meeting at the La Salle Hotel, Chicago, Ill., will feature sessions on Electric Insulation, Electronics, Electro-Organic Chemistry, Industrial Electrolytic, and Theoretical Electrochemistry.

American Society for Quality Control

The 8th Annual Convention of the American Society for Quality Control will be held in St. Louis, Mo., on June 9–11, 1954. Headquarters for this convention will be the Jefferson Hotel. The technical sessions will be held at Kiel Auditorium.

The program will consist of 72 sessions, which will include 67 technical sessions and 5 sessions devoted to plant tours. The Chemical and Textile Divisions are participating as are the Aircraft, Automotive, Electronics, Metals, and Operations Research Committees. Further information may be obtained from U. C. Gramsch, 8th Annual ASQC Convention, P. O. Box 4436, Wade Station, St. Louis 15, Mo.


"Everything that enlarges the sphere of human powers, that shows man he can do what he thought he could not do, is valuable."
SAMUEL JOHNSON

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A brand new "house" where progress lives

Every time Industry turns the doorknob of a new research plant, it opens the door to Progress. The formation of The Udylite Research Corporation and the opening of the largest, most completely equipped research building in the industry are important steps forward in the progress of metal finishing.

Out of Udylite's laboratories during the past quarter century have come a score or more major contributions to the art of electroplating. This pioneering has helped the plating industry to grow through the development of improved processes, more efficient equipment and supplies.

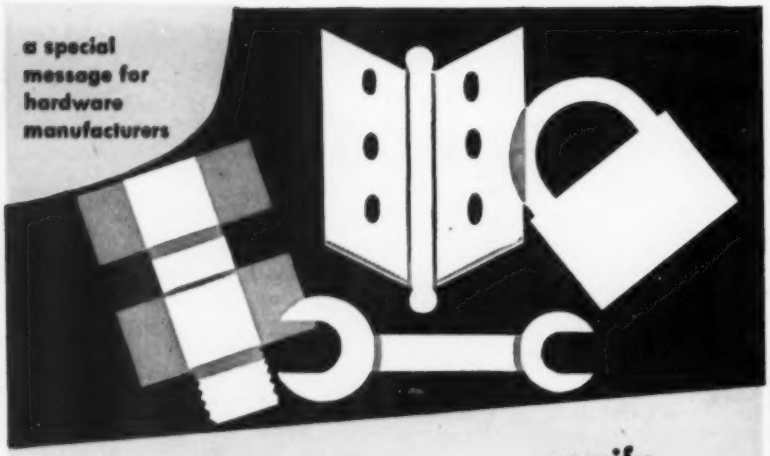
With its new research building, containing a complete pilot plant, six specialized laboratories and the complete metal finishing library, Udylite will expand its research at an accelerated pace, continuing as the source of new and better ways of metal finishing.

The industrial developments of the future are fast becoming problems of the present. The progress of the metal finishing industry in meeting these challenges is now more assured. For Progress moves through the people of research . . . and now Progress has a brand new "home."

PIONEER OF A BETTER WAY IN PLATING

THE **Udylite** CORPORATION
DETROIT 11, MICHIGAN

a special message for hardware manufacturers



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Specify Iridite . . . for corrosion protection during storage or use . . . for a firm and lasting base for paint . . . for extra quality and eye-appeal . . . for low cost color coding of finished parts.

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- **ON ALUMINUM** Iridite gives you a choice of natural aluminum, a golden yellow or dye colored finishes. No special racks. No high temperatures. No long immersion. Process in bulk.
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AND IRIDITE IS EASY TO APPLY. Goes on at room temperature by dip, brush or spray. No electrolysis. No special equipment. No exhausts. No specially trained operators. Single dip for basic coatings. Double dip for dye colors. The protective Iridite coating is not a superimposed film, cannot flake, chip or peel.

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Manufacturers of Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals, ARP Plating Chemicals.
WEST COAST LICENSEE: L. H. Butcher Co.

Personals

R. T. Browning has been appointed vice-president in charge of sales by Wallace & Tiernan, Inc., Belleville, N. J. Appointed at the same time were **William A. Hockett,** director of sales—W&T Division; **Russell C. Clement,** manager of field sales and service; and **Vincent Pisani,** manager of departmental sales.

Browning

Hockett

Clement

Pisani

Browning has had wide experience in both the chemical and equipment lines. He started over 20 years ago as a field salesman and subsequently held positions in the advertising department, the Kooler-Keg Division, manager of Electro Rust-Proofing and most recently as director of sales and secretary of W. C. Hardesty Co., Inc., a W&T subsidiary.

Hockett began his career with W&T in the Chicago office over 25 years ago and later went to the Indianapolis office. Later, he became manager of the export division with responsibility for all the company's foreign operations.

PLANT MANAGER

Desires change to organization with greater opportunity. Married, aged 39, degree. Background includes management, process engineering, all types of plating, polishing, and metal finishing. Capable of installation and operation. Has funds for investment in new connection if desired.

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445 Broad St., Newark 2, N. J.

Clement has been associated with the W&T field organization for over 25 years. For a good part of that time, he was district manager in the Washington, D. C., office.

Pisani, with over 35 years' experience in the W&T organization, has the background of main office sales operations which will be invaluable to the new management.

K. C. Johnson has been transferred from the home office to the Pacific coast as regional field engineer for the Industrial Filter & Pump Manufacturing Co., Chicago, Ill. He will work out of the company's offices at 816 W. 5th St., Los Angeles and also the office at 115 New

Johnson Hesler

Montgomery St., San Francisco, Calif. Johnson joined Industrial in 1949 and most recently was assistant chief engineer.

J. C. Hesler has joined the engineering staff of Industrial as head of the expanded Water and Waste Treatment Division. Hesler comes to Industrial with 15 years' experience in the water and wastes treatment field as research chemist, chief chemist, project and design engineer and in field engineering work.

G. H. Walgren has been elected president and general manager of the J. C. Miller Co., Grand Rapids, Mich., succeeding **J. C. Miller,** who has been named chairman of the board.

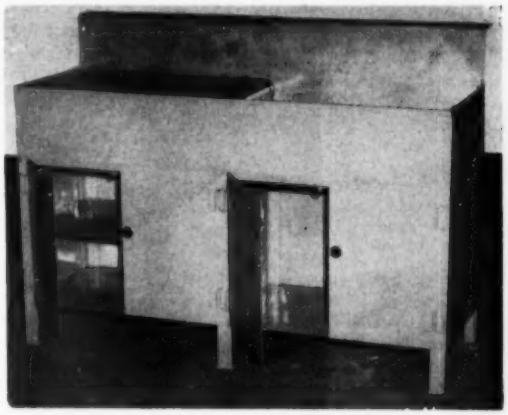
Walgren, who has been executive vice-president of the company, became associated with the J. C. Miller concern 19 years ago in an accounting capacity. He is a native of Grand Rapids and had been associated with other local manufacturing firms before joining Miller.

James A. Badaluco has been promoted to the post of executive vice-president of the firm.

A native of Grand Rapids, Badaluco was graduated from the University of Michigan in 1937 with a degree in chemical engineering. He has had experience in virtually every phase of the business and in October, 1951, became vice-president in charge of research and development. The last few years he has specialized in development of buffing compounds.

Badaluco is a past president of the west Michigan chapter of the American Electroplaters' Society.

Better Cabinets— Welded by STORTS



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Manufacturers of Welded Fabrications to Specification

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John Guss and **John A. Doyle** recently were appointed as sales and engineering representatives by the Lea Mfg. Co. of Waterbury, Conn.

Guss

Doyle

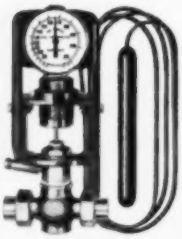
Guss will serve the Midwestern area in a sales and engineering capacity on electrochemical and abrasive finishing problems. He is a graduate of Albright College and Wyomissing Polytechnic Institute. He was chief chemist and metallurgist for four years at Penn-Ohio Steel Corp., Birdsboro, Pa. He was associated also with Valley Platers, Inc., Reading, Pa., Division of Wallace R. Ives, Inc., and Birdsboro Armor Cast, Inc., Birdsboro, Pa.

Doyle will specialize in sales and engineering service to the cutlery and small tool industry on surface finishing problems. A graduate of Catholic University Engineering School, he was associated with Sperry Gyroscope Co., served later with the Navy, Douglas Aircraft Corp., International Silver Co., and G. I. Scott Mfg. Co.

Doyle will serve also as an engineering consultant on the application of liquid buffing compounds to Clair surface finishing machines.

Used by Leaders in the Plating Industry

NEW Temperature REGULATOR



For Plating, Anodizing, Bonderizing, Pickling, Cleaning, Rinsing, and Chromate Dips. Powers No. 11-MF Regulators will help you get the most effective use from various solutions by holding them at the right temperature automatically.

Plastic Covered Thermal Bulb and Tubing—is highly resistant to solutions in above processes. Prevents electrical shorts. No insulators required for the regulator.

Easy to Read 4" Dial Thermometer—indicates temperature of liquid being controlled and makes it easy to adjust regulator for different temperatures.

Bulletin 330 describes this simple, dependable control.

THE POWERS REGULATOR CO., SKOKIE, ILL.
Offices in over 50 Cities, see your Phone Book (b51r)

Over 60 Years of Automatic Temperature and Humidity Control

AES Members at the recent ASTM Committee Week meeting in Washington, D. C. Left to right: Herb Head, Gerry Lux, Bob Miller and Art Du Rose, pictured during a break in the B-8 meeting

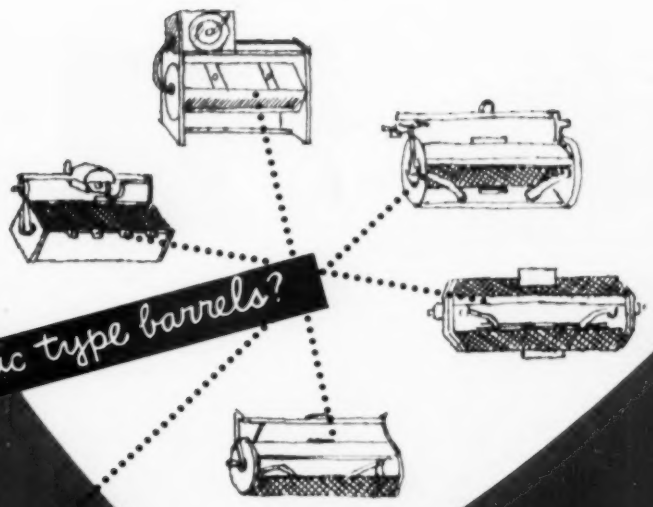
Harry O. Walp, Jr., has been transferred to the New England district office of F. J. Stokes Machine Co., Philadelphia, Pa., as senior sales engineer.

A native of Upper Darby, Pa., Walp studied engineering at Bucknell and Ohio Wesleyan Universities, served 3½ years in the Navy, and then was graduated from Drexel Institute in 1950 with a B.S. in Business Administration. Before joining the Stokes sales staff in January, 1952, he was a technical representative and sales engineer for St. Regis Paper Co.

Ralph H. Stalbaum has joined the sales staff of the New York district office of the company, and **Walter E. Rayber** has been transferred to that office from Philadelphia.

Stalbaum was graduated from the University of Nebraska in 1940 with a B.S. in Chemical Engineering. Before joining the Stokes organization early this year, he had been a development engineer with Sinclair Refining Co., East Chicago, Ind.; New England district manager for the Duriron Co., Dayton, Ohio; and district manager in Pittsburgh, Pa., for the Byron Jackson Co., Los Angeles.

Slated to serve another 2-year term as heads of ASTM committee B-8 are: left to right, R. B. Saltonstall, secretary; C. H. Sample, chairman and K. Huston, vice-chairman



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HS is a heavy duty cleaner of medium alkalinity, particularly effective in plastic-type barrel cleaning operations where high detergency is required at relatively low temperatures. This anhydrous, silicated cleaner gives maximum cleaner life, produces no undesirable scums in the acid or rinse tanks, and rinses off quickly and completely. Cowles HS is especially formulated to handle extraordinary heavy soil loads in barrel lines or other soak tank operations, including removal of large amounts of oil.

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Personals

Rayber joined the Stokes sales staff in Cleveland immediately after graduation from Case Institute of Technology in 1950 with a B.S. in Industrial Engineering.

Joseph E. Butler has been named sales engineer for the Whitfield Chemical Co., Detroit, Mich. His territory will include parts of Michigan, Ohio and Indiana. Formerly, Butler was an industrial expediter with the Curtiss Wright Corp.

A native Detroiter, he attended Wayne University and Michigan State College.

Ezra A. Blount, member of the Cincinnati Branch of the AES and editor of PRODUCTS FINISHING, has been singularly honored by the Japanese Electroplating Society (Nihon Mekki Kyokai) which has published a booklet entitled "Mr. E. A. Blount." It is not often that a living man receives this sort of a tribute.

Blount

On page 3 of the booklet is a report on the talks that Blount gave to the NMK. On page 9, there is a reproduction of his paper on diaphragm plating tanks which was given at the 1951 Buffalo AES meeting. Other pages include a reprint of his paper on Japanese electroplating, photos of the exhibit he had at the 1953 AES meeting in Philadelphia and reports of trips and visits to shops in Japan.

Ralph Morse has been named plant engineer by the Chandeysson Electric Co., St. Louis, Mo. In his new capacity, Morse will be in charge of all plant utilities, construction and maintenance. He also will supervise maintenance of all plant equipment and will carry out special assignments for the engineering and plant manager.

Morse

Formerly supervisor of Chandeysson's testing facilities, Morse has been with the company four years. Prior to joining the St. Louis firm, he served as an electrical engineer for the Missouri Pacific Railroad. He is a graduate of the University of Missouri's engineering school.

Richard C. Booth was recently appointed to the technical service staff of Wyandotte Chemicals' Pacific Coast plant.

Booth graduated in chemistry from San Diego State College and also studied at Yale. He has been employed as a paint

Booth

chemist and as a process engineer by two well-known California firms. In addition, Booth served the U. S. Naval Air Station and U. S. Naval Ordnance Test Station for five years. He is a member of the ACS and the Society of Aeronautical Materials and Process Engineers.

Eugene N. Jarvis of Detroit has been appointed factory sales and service representative in the southeastern Michigan area by the Gravi-i-Flo Corp., Sturgis, Mich. Jarvis joins Grav-i-Flo with many years' experience in the metal finishing field. His headquarters will be at the Wagner Brothers offices, 400 Midland Ave., Detroit. Wagner Brothers Company has added the Grav-i-Flo line to its rapidly expanding facilities.

MAINTENANCE COSTS dip

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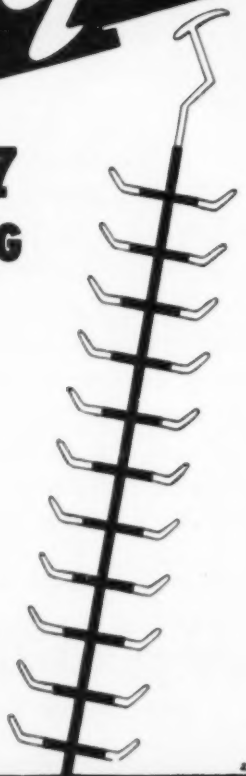
Air-Dry RACK COATING

This new "higher-solids-content" rack coating builds up a thickness of five mils per dip — four easy dips instead of the seven usually needed to build a safe 20 mil coat — cuts rack handling time almost in half. This higher-solids-content means a denser, less porous coating, — safer, more efficient, longer-lasting protection.

Tygon 277 requires no primer, it is self-adhering; requires no baking, it air dries quickly; requires no laborious application techniques, just dip and air-dry—that's all.

Place a trial order for a gallon today. Check it against the best you've known. You'll go Tygon 277 all the way.

Plastics and Synthetics Division



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CHANNEL MASTER CORP.

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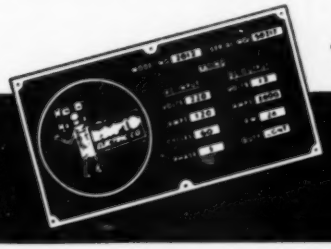
Original installation of 6000 amp. Remote Control Rapid Electric Selenium Rectifier. It was the performance of this rectifier that influenced Channel Master to turn to Rapid when additional power was needed.

Six years ago, when the television industry was still in its infancy, Channel Master Corporation started manufacturing quality antennas in a barn near Ellenville, New York. The original staff consisted of ten employees. Their plating (zinc, cadmium or nickel on hardware and tubing for protection against weather) power requirements were easily handled by a 6000 amp. Rapid Electric Co. Selenium Rectifier.

Now, due to the tremendous growth of television, plus a reputation for turning out a well-engineered, well-tested, quality antenna, Channel Master has grown to a point where they now employ over 800, and are completing a new 2 acre addition to their large, modern plant. Their plating power requirements are now 40,000 amps. — met exclusively by Rapid Electric Co. Selenium Rectifiers.

Through the years, whenever more plating power has been needed, Channel Master has turned to Rapid. They realize that there is no substitute for an efficient, dependable, low cost maintenance-free source of D-C Plating Power. And, experience has shown them that Rapid Electric Co. Selenium Rectifiers give them this kind of power.

If you plan to increase your Plating Power, it will pay you to turn to Rapid. Rapid Electric Selenium Rectifiers are available in models ranging in size up to 250 KW-DC output capacity, available as basic types (for fixed voltages), with half-controls (for the upper-half of the range only), with full controls (for the entire range) or with remote full controls. Or, if your needs cannot be met from our large selection of standard models, we can build the equipment to do the job.



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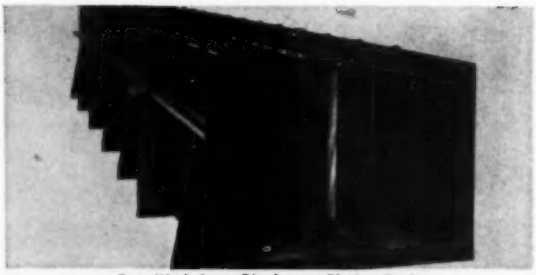
To reduce costly buffing due to roughness . . . prevent rejects resulting from thin spots . . . have an ARco engineer show you how simply Diaphragm Systems can save time, materials . . . and customers . . . for you.



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For uniformly high quality and economy in plating . . .

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Trade Literature

L—400. Stop Off Lacquer—A new peelable stop off lacquer known as Micropeel is announced by Michigan Chrome & Chemical Co. of Detroit.

Micropeel may be used in all plating cycles to hold a hairline demarcation. After plating, it may be peeled readily, saving time and money over laborious soak and scrub type stripping operations.

Micropeel may be applied by brushing, dipping or spraying. Thorough instructions concerning the proper use of reducer for maximum results are incorporated in a fully descriptive circular. For your copy, use Reader Service Card.

L—401. Some Unsolved Problems—A booklet published by the ASTM entitled "Some Unsolved Problems"—a compilation by ASTM's Administrative Committee on Research, intended to stimulate studies of those properties of materials concerning which information is needed—has been announced as available.

Copies of this 24-page booklet may be obtained, without charge, from the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

L—402. Felt Products Catalog—A new general catalog describing the Paramount Brand felt products manufactured by the Bacon Felt Co., West Water St., Taunton, Mass., has been released.

Included in the catalog are illustrations and descriptive matter on wool-felt wheels, bobs, and sheets and hair-felt sheets and wheels. In addition, there are several valuable tables on felt wheel selection and specifications, "how-to-do-it" hints, and physical and chemical properties for each size and grade felt. Copies of the catalog may be secured by using Reader Service Card.

L—403. Handbook Gives Hints on Vacuum Pump Care—Dozens of practical tips on installing, operating, and maintaining vacuum pumps and vacuum systems are contained in "How to Care for Your Vacuum Pump," a new 16-page handbook issued by F. J. Stokes Machine Co., 5500 Tabor Rd., Philadelphia, Pa.

The manual, intended for all who install, operate and service vacuum pumping equipment, contains such helpful hints as: the proper way to make leakproof connections in vacuum piping layouts; recommended types of gages, valves, fittings and gaskets; step-by-step trouble shooting procedures to be followed when the pump is knocking, will not start, or will not produce a satisfactory vacuum; and

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for CORROSIVE and NONCORROSIVE LIQUIDS and GASES

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Whether for laboratory or pilot-plant requirements or large-quantity processing, it will pay you to look into the INDUSTRIAL tailored units for heating or cooling liquids or gases. Rather than adaptations of standard units, INDUSTRIAL heat exchangers are engineered and built to individual performance specifications. Depending on size and other operating conditions, the INDUSTRIAL heat exchanger may be a large single- or multiple-pass tube-bundle type or a series, parallel, or series-parallel combination of individual single- or multiple-tube units. In any type unit, thermal shock and the requirements of the corrosive or noncorrosive fluid on the tube or shell side determines the materials of construction. Thus, each INDUSTRIAL tailored heat exchanger embodies the ultimate in operating performance and efficiency at lower initial and maintenance costs.

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some 25 "Do's" and "Don'ts" to insure long and trouble-free service life of vacuum systems. For your copy, use Reader Service Card.

L—404. Polyethylene Valves For Highly Corrosive Fluids—A new bulletin describing the Vanilene polyethylene valve produced by Vanton Pump and Equipment Corp., Empire State Building, New York City, is offered to those concerned with flow control of corrosive fluids. Containing diagrams, illustrations and complete specifications, on 1- and 2-inch polyethylene valves, this information will be of particular interest to those in the chemical and allied industries. For your copy, use Reader Service Card.

L—405. Radiography Booklet—A guide for X-raying such metals as steel, magnesium, and aluminum, with recommendations as to type of film and exposure for each, is described in a new 28-page, three-color booklet issued by the DuPont Co., Photo Products Dept., Wilmington 98, Del.

The booklet, titled "DuPont Products for Industrial Radiography," provides exposure and processing data for each of the company's films used in industrial radiography. For your copy, use Reader Service Card.

L—406. Rubber Products Literature—New literature describing the injection molding of Silicone rubber products has been issued by Minnesota Rubber and Gasket Co., 5724 W. 36th St., Minneapolis 16P, Minn.

The literature defines the properties and applications of Silicone rubber, together with suitabilities of the material regarding specific types of products. For your copy of this literature, use Reader Service Card.

L—407. New Tank Lining Booklet—The U. S. Stoneware Co., Akron 9, Ohio, has just released Bulletin K-10 on "Kel-F" welded membrane—a new approach to the "impossible" tank lining jobs.

This 4-page, 2-color bulletin gives full information on how the new welded membrane can be utilized as a lining with virtually an unlimited size range for steel tanks.

Photographs on the assembly and installation of this unique membrane as well as charts on physical properties, temperature range, and chemical resistance of Kel-F make this an informative booklet for engineers confronted with tricky lining jobs. For your copy use Reader Service Card.

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PATENT PLASTICS CHEMICALS

L—408. Booklet on Valve Selection and Maintenance—Publication of a new booklet, "Getting the Most Out of Your Valves," by William C. Hookway, Product Engineering Manager of the Cooper Alloy Foundry Co., Hillside, N. J., has just been announced. The booklet covers the selection of valve types and materials, installation and operation hints, as well as inspection and maintenance pointers. For your copy, use Reader Service Card.

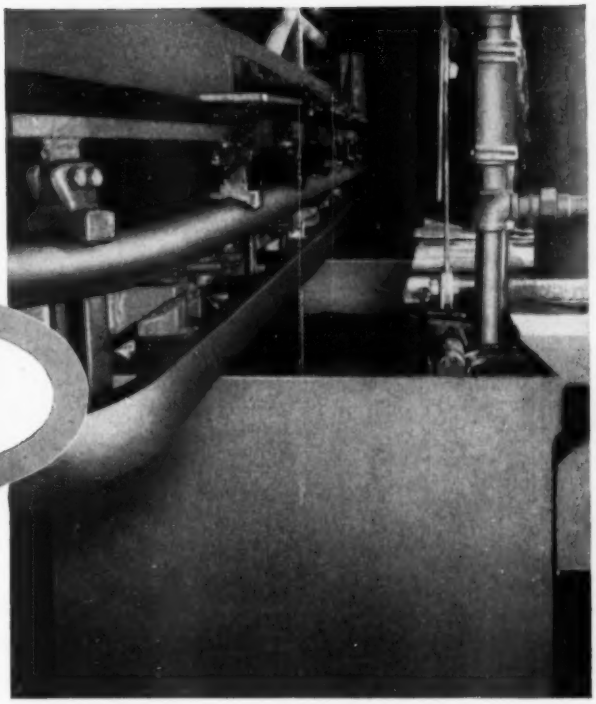
L—409. Rusty Metal Primer—A new rusty metal primer permits application of Bakelite vinyl resin-base protective topcoatings to industrial equipment without resorting to sandblasting or other means of surface preparation. The resistance of Bakelite vinyl resins to acids, alkalies, salt air and industrial fumes makes them an ideal base for industrial protective coatings. Distributed by Surface Engineering Company, Inc., 1535 Barwise Ave., Wichita, Kans., the new primer is intended only for rusty metal surfaces. This rusty metal primer is especially useful where rust removal by sandblasting is impractical due to spark hazards, danger of contaminating nearby equipment, or the cost, time and small area involved. The rusty metal primer is not recommended for new or bright metal. For descriptive literature on this product, use Reader Service Card.

L—410. Tabulation Aids Choice of Ultrasonic Test Instruments—An illustrated 4-page folder just issued by Branson Instruments, Inc., 430 Fairfield Ave. Stamford, Conn., presents in organized form all the essential data necessary to an intelligent selection of the ultrasonic thickness-measuring instrument best suited to a particular problem or set of problems.

Application, range of thickness, accuracy, physical and electrical characteristics, are among the topics covered in detail, and there is an extensive listing of the

DIVERSEY no. 909

DIVERSEY no. 12



Loading end of fully-automatic cadmium line at Miller's Jackson, Michigan plant.

MILLER PLATING CORP.
JACKSON, MICHIGAN *says:*

"No Finer Cleaners are to be Found... Anywhere!"

Diversey is proud of this endorsement from busy, well-known Miller Plating in Jackson, Michigan. Metal cleaning at Miller's is both manual and fully automatic. And to meet Miller's rigid standards, cleaners must be outstanding performers.

SAYS MR. H. E. WELCH, MILLER CORPORATION VICE-PRESIDENT:

"We have used Diversey Products exclusively in soak and electro-cleaning operations prior to all types of decorative and rustproof plating for over three years. We believe no finer cleaners are to be found anywhere!"

HERE'S WHAT DIVERSEY NO. 909 AND NO. 12 OFFER YOU:

No. 909 is a unique, caustic-free, heavy-duty soak tank cleaner for any metal. No. 12 is an electro-cleaner. It's exceptional in that it may be used with either direct or reverse current . . . has a controlled foam blanket to materially reduce the explosive hazard . . . has such high conductivity that you're assured full loading of tanks thereby increasing production and cutting costs. No. 12 is perfect for shops with limited power capacities.

LOOK INTO THESE TWO OUTSTANDING DIVERSEY CLEANERS:

They'll do a better job for you, cut your costs. Write today for additional information, or call your Diversey D-man.

Please send me more information about

☐ Diversey No. 909
☐ Diversey No. 12

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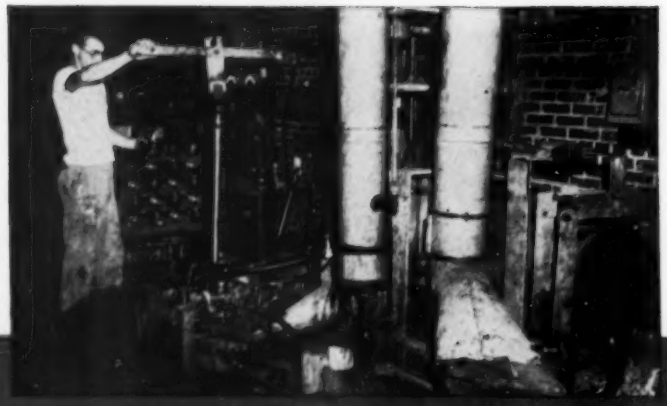
1820 ROSCOE STREET, CHICAGO 13, ILL.
IN CANADA: THE DIVERSEY CORPORATION (CANADA) LTD. PORT CREDIT, ONT.



20-year old Chandeysson Motor Generator in service at Miller Electroplating, Inc., Evansville, Indiana

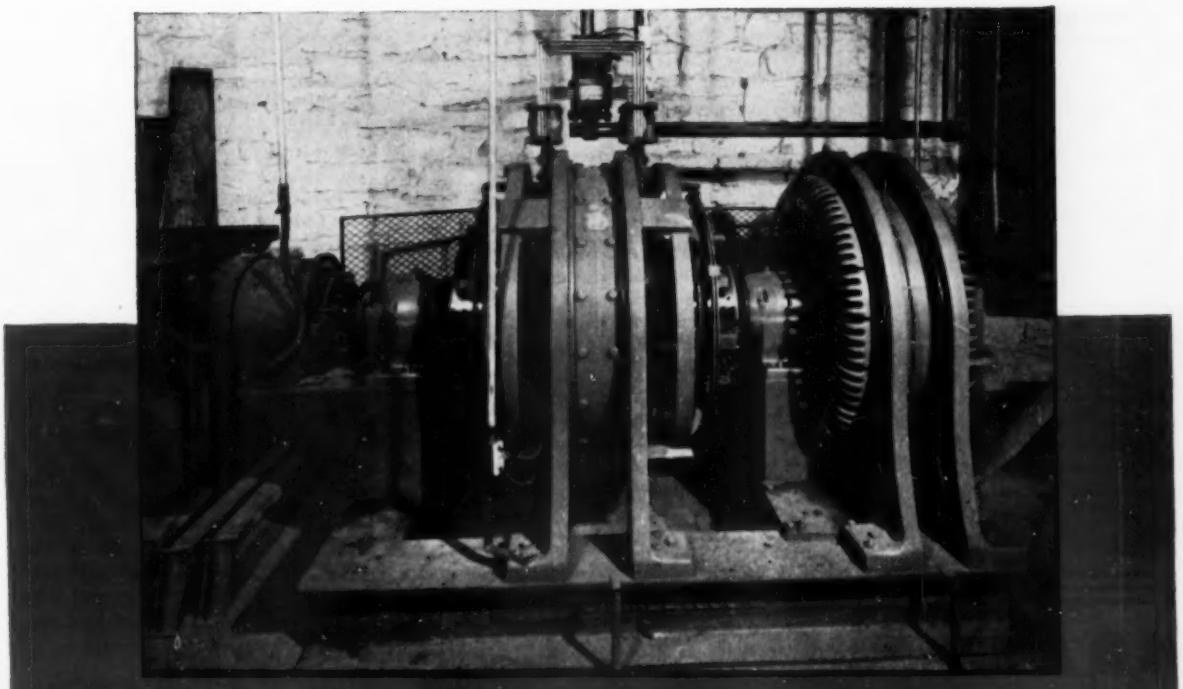
Chandeysson CUTS POWER

Convert with Chandeysson and Save 4 ways

1. Use less power
2. Get more out of the power you pay for
3. Be sure of power when you need it most
4. Enjoy lifetime power dividends

Bulletin D-102 contains complete data on specific and overall savings possible with every Chandeysson installation. If you are interested in power savings and power dependability, it will pay you to read this bulletin. Your copy sent promptly, and without obligation.

GOLDEN 1904 Chandeysson 1954 JUBILEE



CONVERSION COSTS

agrees Miller Electroplating, Inc. of Evansville, Ind.

16 hours a day for 20 years carrying overloads of 20% to 25% with the only maintenance in all that time being new brushes . . . that's the Chandeysson record at the Miller Electroplating, Inc. It's not an unusual record—there are Chandeysson units still being used after 48 years of economical service!

Read Mr. Miller's actual letter—

"... We have three of your machines in operation in our plant. The last two being purchased after using the first one for over 20 years.

"Our first machine has been in use on the average of 16 hours a day. A great deal of this time, carrying an overload of from 20 to 25% of its rated capacity. During this time the only maintenance expense has been new brushes. It might be of interest for you to know that the commutator has not even been repaired during this time.

"We are indeed thoroughly sold on Chandeysson Plating Generators.

Very truly yours,
MILLER ELECTROPLATING, INC.

Paul E. Miller, Pres.

Any way you say it, or figure it, such performance is proof once again that "Chandeysson cuts power conversion costs." You can expect similar performance from a Chandeysson installation in your plant. Write or mail coupon for full information.

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St. Louis 16, Missouri

Please send me a copy of Bulletin D-102.

Name .....

Company .....

Address .....

City ..... Zone ..... State .....

Trade Literature

various types of transducers available for the instruments for different types of work. For your copy of this informative folder, use Reader Service Card.

L—411. Mounted Wheel Catalog—A new 8-page color catalog has been released by the Metal Removal Co., 1546 N. Orleans St., Chicago 10, Ill., on their line of porcelain and resinoid bonded mounted wheels. Wheels are classified into "A," "B," and "W" shapes with the "A" and "B" grinding shapes illustrated full size. All dimensions are clearly shown and the catalog acts as a handy guide in selection of the proper shape for the type job to be done. The catalog also contains illustrations and listings of abrasive cartridge and small grinding wheel mandrels and rubber polishing wheels. For your copy of this catalog, use Reader Service Card.

L—412. Portable D-C Indicating Instruments Bulletin—A new bulletin on portable d-c indicating instruments has been announced by the General Electric Company, Schenectady 5, N. Y.

Designated GEC-979A, the 8-page illustrated publication provides information on the applications, features, prices and performance of the company's Type DP-11 and DP-12 instruments. For your copy, use Reader Service Card.

L—413. Literature on General Industry Coatings—A new 8-page folder, "Bakelite Resin Coatings for General Industry," has been issued by Bakelite Company, a Division of Union Carbide and Carbon Corp., 300 Madison Ave., New York 17P, N. Y. The folder reports on decreased maintenance costs, extended service life and other advantages these protective coatings afford the construction, petroleum, chemical, food and transportation industries.

Twenty photographs illustrate actual case histories of coatings based on Bakelite resins in various applications.

Copies of this folder may be obtained by using Reader Service Card.

L—414. Bulletin on Transparent, Flexible Tubing—Ace-Flex, a new all-purpose plastic tubing with unusual flexibility and clear transparency, is covered in a new bulletin 66-D, published by American Hard Rubber Co., 93 Worth St., 13P, N. Y. Physical properties, chemical resistance, standard sizes and general characteristics of Ace-Flex tubing are included in the 4-page, 2-color bulletin. Many suggested applications in chemical processing, laboratory and general industrial uses are presented. For your copy, use Reader Service Card.

L—415. Bulletin on New Wet Blasting Machine—A bulletin describing its new Model 30 Liquamatte wet blasting machine, has been published by American Wheelabrator & Equipment Corp., 1180 S. Byrkit St., Mishawaka, Ind. Complete general specifications and illustrations are presented. The new unit is designed for all sorts of precision cleaning and finishing operations involving small parts which can be lifted and handled manually, and which are capable of going through a door opening 22½ x 19 inches. Copies of the bulletin may be obtained by using Reader Service Card.

L—416. Specialized Instruments Bulletin—A new condensed bulletin has been published by F. W. Dwyer Mfg. Co., 317 S. Western Ave., Chicago 12, Ill., presenting the company's broad line of specialized instruments and gauges. Included are instruments for accurate measurement of combustion, draft, pressure, flow, vacuum, CO_2, smoke, velocity, static pressure, pressure differential, temperature and other similar studies. Each type is illustrated and clearly described. For your copy of this bulletin, use Reader Service Card.

L—417. Plastisol Compounds Booklet—A completely new booklet has been issued describing in detail Chem-O-Sol, the trade name for plastisol compounds formulated by the Chemical Products Corporation of King Philip Rd., E. Providence, R. I.

This fascinating 12-page booklet discusses properties and describes a few applications of the new compounds. For your copy, use Reader Service Card.

BRASS PLATING WITH TRUE BRITE

❶ improve color

❷ save labor

❸ eliminate supervision

❶ *color stays constant . . . no rejects*

❷ *eliminates frequent analyses . . .*

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Write for FREE bulletin! Your key to better Brass Plating

Available in regular 3 to 1 ratio for yellow Brass Plating.

Special ratio materials for plating richlow brass or any other desired alloy of copper and zinc.

Suitable for both still tanks and barrels.

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P. O. Box 31, Oakville, Conn.

The BIGGEST Time and Money Savers in Plating Rack History!

Racks for any job when you need them.
No delay—no waiting.

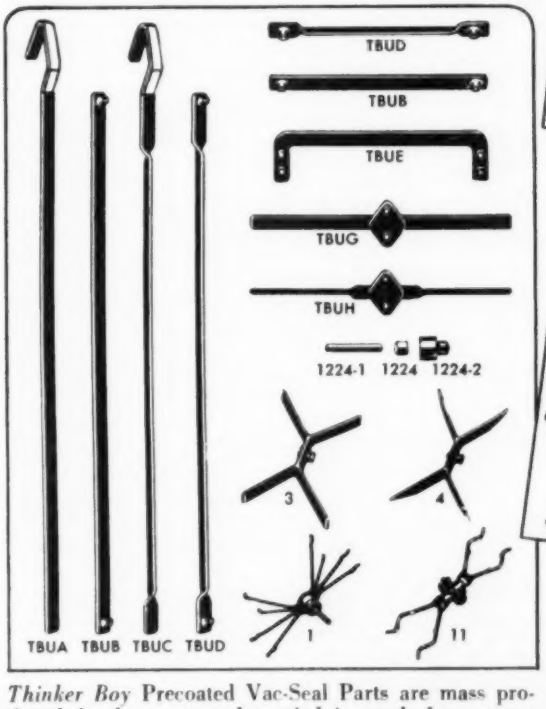
Quick and easy conversion.
Racks easily changed to fit different jobs—you can have top efficiency on every job.

Replaceable Tips for easy tip upkeep.
Enable you to keep every rack at full capacity.

Tremendous saving in plating rack costs.
You can make new racks designed for the job from members of discarded Thinker Boy Racks at the mere cost of assembly.

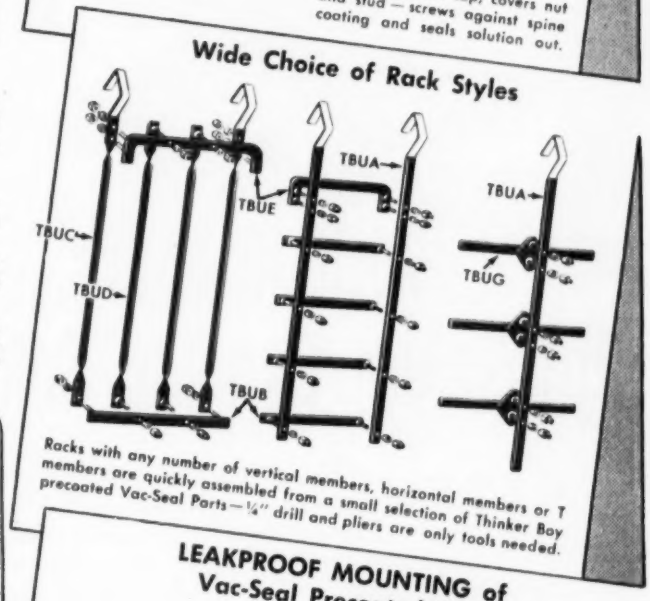
No added investment necessary. *Here's how you can cash in on the tremendous time and money saving economy of Thinker Boy Racks without investing an extra dime.*

1. When you need racks get *Thinker Boys*. Vac-Seal replaceable tips enable you to keep every Thinker Boy Rack at full capacity.
2. When Thinker Boy Racks of one design are no longer needed, convert them to a design you need or disassemble and store the parts.
3. When you need racks for a different job, assemble them from your stock of used Thinker Boy Parts. You get racks designed for the job in a matter of minutes for the mere cost of assembly.



Thinker Boy Precoated Vac-Seal Parts are mass produced for low cost and carried in stock for prompt shipment. Furnished in any assortment or assembled to your specification. Ask your BELKE Service Engineer or write for descriptive bulletin and parts list.

LEAKPROOF ASSEMBLY of Thinker Boy Precoated Plating Rack Members
Tapered knurled fitting wedges into spine, assures contact — prevents pressure on coating.
Heavy coating of BELKE Universal Plastic.
No tapping — just drill ¼" holes.
BELKE Vac-Seal—joins frame coating with leakproof seal—keeps solution out.
Tapered nut wedges into spine, bears all stresses — avoids injury to spine coating.
Threaded plastic cap, covers nut and stud — screws against spine coating and seals solution out.


Wide Choice of Rack Styles
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TBUE
TBUA
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TBUG
TBUD
TBUB
Racks with any number of vertical members, horizontal members or T members are quickly assembled from a small selection of Thinker Boy precoated Vac-Seal Parts—¼" drill and pliers are only tools needed.

LEAKPROOF MOUNTING of Vac-Seal Precoated Tips
BELKE Vac-Seal — joins rack coating with leakproof seal.
Frame and Tip precoated with BELKE Universal Plastic.
No tapping. Just drill ¼" hole.
Tapered nut wedges into spine—bears all stresses—avoids injury to coating.
Knurled shank wedges into frame — cannot twist or turn — assures positive contact.
Threaded Lucite Cap, encloses stud and nut —screws against rack coating and seals solution out.

Belke MANUFACTURING CO.
947 N. Cicero Ave.
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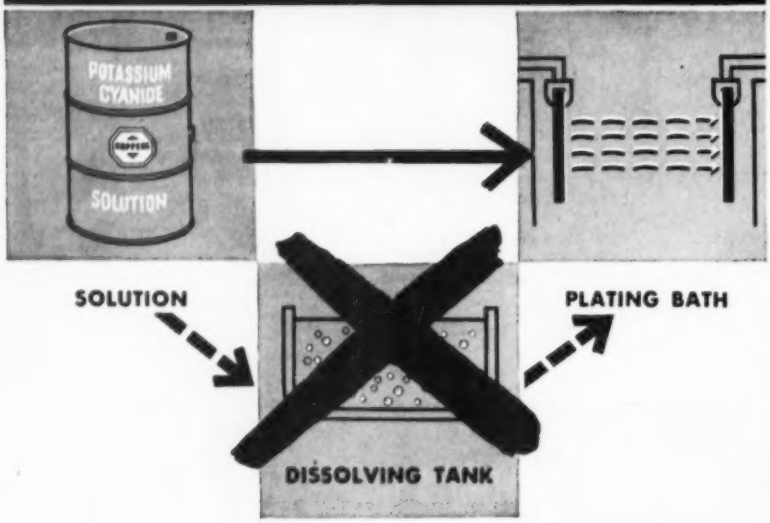
EVERYTHING FOR PLATING PLANTS

Short-cut to lower plating costs



with Koppers Potassium Cyanide Solution

KOPPERS Potassium Cyanide Solution (35-40%) eliminates the dissolving step in your plating operation. It is delivered to you, ready for the plating bath. Time-consuming preparation is out. There are no dangerous cyanide granules to handle, no drum cleaning, and no need to expose working personnel to cyanide powder dust.

All of these unique qualities of Koppers Potassium Solution add up to lower costs to you.

You can order Koppers Potassium Cyanide Solution in 55-gallon drums or in tank-truck quantities, ready to be pumped directly into your storage tank.

Potassium Cyanide is only one of the many synthetic chemicals produced by Koppers. Others include Resorcinol, Styrene Monomer, Polystyrene, Phthalic Anhydride, Divinylbenzene, and Di-tert-butyl-para-cresol.

For further information on any of these chemicals, write to:

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Equipment and Supplies

E—418. Synthetic Resin Bonding Cement—The Ceilcote Co., 4842 Ridge Rd., Cleveland, Ohio announces a new improved synthetic resinous bonding cement for brick and tile—Corobond. The material resists the corrosive effects of acids, alkalies and solvents. Chief advantage of

Corobond resin cement is its superior workability and longer pot life which provides a greater working time prior to initial set, regardless of temperature. A mixture of acid hardeners, acting on a delayed reaction principle, slow the initial hardening of Corobond and allows ample working time when large batches are mixed. Once started, final cure proceeds rapidly to permit continuous laying-up without extrusion from the bottom courses and to prepare the structure for use within a relatively short time. Corobond hardens with minimum shrinkage to an extremely dense material which provides high mechanical and tensile strength. For more information on this cement, use Reader Service Card.

E—419. Room-Temperature Metal Cleaner—A new highly efficient metal surface cleaner that can be used at room temperatures has been developed by Klem Chemicals, Inc., 14401 Lanson, Dearborn, Mich.

K-A-T Cleaner is a combination of a special alkaline and an efficacious emulsion cleaner and can be used for removing soil from both ferrous and nonferrous metals.

The formula is adapted to use in hard-water areas. Maximum corrosion resistance and minimum surface etching are claimed for the product, as well as the

Saving Nickel

Lea Copper-Glo

Something New in Bright High Speed Copper Plating

...Production Proved

The Lea-Ronal Bright Copper Process* is the answer to the plater's prayers, particularly when nickel is still short in supply. Lea Copper-Glo, used with this process, makes it practicable to chrome plate prefinished steel and die-castings over thinner layers of nickel than needed with other processes. With this copper plating you can cut your bright nickel deposit to a minimum because the nickel does not have to be used to build 'brightness.' The copper deposit obtained from the Lea-Ronal Process is brilliant in itself. Thus, you will save by being able to use heavier copper and lighter nickel.

The user of Lea-Ronal Bright Copper Process enjoys numerous advantages, as for example:

OPERATING

- Brilliant ductile deposits
- High current density with 100% efficiency
- Exceptional throwing power
- Operations with or without free-rinsing wetting agents depending upon specific production conditions
- Direct, interrupted, or periodic reverse current

COST SAVINGS

- High speed operations reduce tank plating time (Hull cell bright current density range 0 to 60 amp/ft.^{2})
- Reduces rejects whether followed by bright nickel plate or otherwise
- Reduces consumption of copper cyanide because of excellent anode corrosion

The Lea-Ronal Bright Copper Process, using Lea Copper-Glo, can be fitted into your plant operating cycle. Most cyanide copper baths can be converted to obtain these advantages.

*Patents Pending

The LEA GROUP
serving the Finishing Field
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Sales and Manufacturing Plant
237 East Aurora Street, Waterbury 20, Conn.

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A 428.

Equipment and Supplies

fact that the protective film which it imparts to the work piece is compatible with paint solvents, making painting possible immediately after rinse. For technical information, use Reader Service Card.

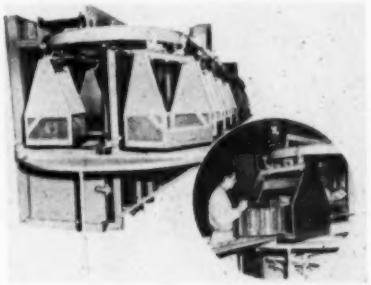
E—420. Skid-Proof, Corrosion Resistant Floor Coating—Neofloor is a new, economical and easily applied skid-proof surface coating for concrete, wood and metal floors. Developed by the Pennsylvania Salt Mfg. Co., 1000 Widener Building, Philadelphia 7, Pa., for use in plants, shops and other places where oils, greases and chemicals create safety hazards and maintenance problems, NeoFloor provides safe, comfortable footing and long lasting surfaces which stand up under heavy traffic, heat-aging and other rugged conditions.

It is a grit-like material anchored in a matrix of resilient Neoprene and bonded firmly to the floor with an adhesive primer. Both primer and coating are supplied in liquid form for easy, quick drying application with brush or roller.

It is a tough, tightly bonded material which is highly resistant to fumes, spillage from acids, alkalies, salt solutions and solvents at temperatures up to 220° F. Also waterproof, NeoFloor is impervious to oils and greases and is cleaned easily with commercial detergents and cleaners. For more information on this product, use Reader Service Card.

E—421. Magnus Cleaning Machine—The equipment Division of the Magnus Chemical Co., Inc., Garwood, N. J., announces a completely new automation development for the metal working industry, a fully automatic multistage batch cleaning and processing method.

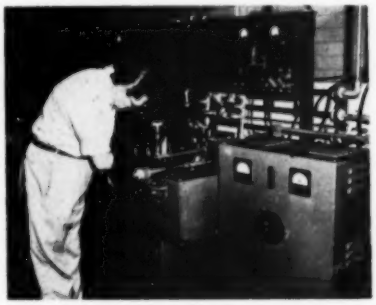
This revolutionary equipment, invented and pioneered by Magnus under the trade name "Aja Lif Automatic," consists of a series of independent, self-contained dipping units serviced by an automatic conveyor system.



The dipping, raising, and transfer of the parts from one stage to the following stages is not only fully automatic but in addition the work to be processed is vigorously agitated up and down in each solution according to a predetermined exposure time program.

The entire operation is fully automatic. The whole unit is serviced by only one operator. For more information on this equipment, use Reader Service Card.

E—422. Orlon Work Clothes Help Solve Plating Lab Problems—A major source of concern and expense among firms that do plating always has been excessive damage to employees' clothing through the splashing of acid plating solutions and caustics.



One company that has effectively licked this problem is Hanson-Van Winkle-Munning Co., Matawan, N. J. They found that the previous cost of work clothing—with acid burns appearing in one day and ordinary work clothing becoming unserviceable in one week—was a major factor.

According to E. E. Carlson, electroplating manager, Worklon shirts and trousers of Du Pont Orlon solved the problem.

Besides its amazing acid-resistance and durability under extremely damaging con-

COMPACT • PORTABLE • AUTOMATIC

Sel-Rex JET PLATER

A COMPLETE PLATING UNIT

Consisting of

- RECTIFIER with automatic timer
- TANK
- FILTER
- PUMP
- AGITATION
- TEMPERATURE CONTROL

Designed for high speed, mass production precious metal plating or for use in the laboratory for any small-volume alkaline plating bath. Also ideal for use with a portable plating barrel. The JET-PLATER is equipped with a stainless steel tank but can be furnished with a rubber-lined or koreseal tank for acid plating solutions.

Standard models — 10, 20, 30 gallon tanks. Larger sizes up to 100 gallons furnished to your specifications.

Complete details on request.

SEL-REX PRECIOUS METALS, INC.

Dept. PL-4 , 229 Main Street • Belleville 9, N. J.

Pioneers and developers of better gold, silver, nickel, copper, cadmium and rhodium salts and solutions.

Not a Trace

. . . of *RESIDUE*, that is with *NEW* AHCO Burnishing Compounds

Residue vanishes in a water rinse . . . burnished surfaces are left clean, bright, and film-free, but it's no mystery because this new series of AHCO Burnishing Compounds is formulated only from non-saponaceous materials that contain the last word in surface-active agents. These compounds are free-flowing, dry, non-toxic, and non-corrosive powders which are, of course, freely soluble in water. They're prepared especially for applications where the sticky residues from soap-like mixtures are objectionable. For rolling and burnishing before plating, AHCO burnishing Compounds assure excellent adhesion and maximum lustre. For preparing surfaces before lacquering, painting or other processing . . . for burnishing plated parts to remove plating compound residues, that would cause staining or spotting, there are AHCO Burnishing Compounds made to order. Find out *now* how one or more of the many new AHCO Burnishing Compounds can do that better job in your plating or finishing room.

For full details about AHCO Burnishing Compounds write today for Bulletin B-10 to Apothecaries Hall Co., 22 Benedict Street, Waterbury, Connecticut.

Apothecaries Hall Co.

Equipment and Supplies

ditions, Orlon workclothes wash easily and dry quickly. For further information on Worklon clothes for every purpose, communicate with Worklon, Inc., 253 W. 28th St., New York, N. Y., or use Reader Service Card.

E—423. Abrasive Belt Grinder—The Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo, Mich., have added a new 1-inch flexible abrasive belt grinder-polisher to their wide line of abrasive belt machines.

The Model F-1 is not expensive, yet it is designed to serve a multitude of needs. It can be used with excellent results for deburring, grinding and polishing and with 10½ inches throat depth permits finishing of hard-to-get-at areas. Work table and belt platen permit accurate grinding of flat surfaces. Irregular con-

tours can be ground on a "free" belt by removing platen and work table. For more information on this new unit, use Reader Service Card.

E—424. New Phosphate Cleaning Materials—A group of phosphoric acid type cleaners has been developed by the Detrex Corp., Detroit 32, Mich., intended mainly for products that are too large or heavy to be phosphate-coated with normal production methods, and for manufacturers whose production does not warrant elaborate equipment for phosphate cleaning.

Called the 800 series, this latest addition to the Detrex family of phosphate cleaners rounds out the line, and makes Detrex the only producer with facilities to supply the complete needs for phosphate coating compounds, alkali and emulsion cleaners, and the equipment needed to use these cleaners efficiently.

The new series meets every government specification for this type of product. The new cleaners will be especially compounded to meet the particular requirements of each installation upon the recommendation of a field service engineer.

Detrex laboratories have found that the 800 series of cleaners can be applied by any practical method such as brush, sponge, dipping, or flowed-on, and can be specified to incorporate such properties as detergency, oil solvency, rust and scale removal. For more information on these materials, use Reader Service Card.

E—425. Chromic Acid Spray Reduced to Zero—That dangerous and costly nuisance—chromic acid spray—now can be completely eliminated from chromium plating bath operations.

A product of The Udylite Corporation's research staff, the new surface active agent of a chemically different structure is called Zero-Mist. It completely prevents air and airborne contamination from chromic acid spray and mist.

Dr. Henry Brown, Udylite's Research Director, explains the new development as a control within the solution.

Zero-Mist will form only a thin foam blanket even when an excessive quantity is put in the bath, but this blanket is not necessary for the efficient operation of the additive.

Completely stable and virtually indestructible, Zero-Mist is not affected by concentrated chromic acid solutions at any temperature or by the highest anode

Is Your Dryer A BUCKING BRONCO?

In order for a centrifugal dryer to stay put it should be heavy. That's why the modern Nobles Dryer is about twice the weight of most dryers. Extra weight is one of the reasons for its stability, its freedom from vibration, its smooth operation, and long trouble-free life.

It's all new in design and principle. A powerful suction fan *draws* the air completely through this modern Nobles Dryer and exhausts it at the bottom! Electric or steam heaters are mounted in the cover of this machine of advanced design for a saving of space and elimination of heat loss.

Air moving equipment isn't an extra. The powerful suction fan is an integral design feature of each machine. A brake pedal extending around the entire work area controls an internal, expanding hydraulic brake for quick, smooth stops.

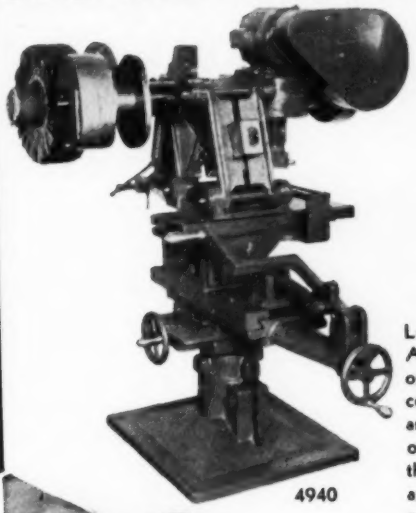
Why not take the first step now toward modern quick drying and lowest costs?

NOBLES ENGINEERING & MANUFACTURING CO.

ST. PAUL 4, MINNESOTA

Write Today for the FREE NOBLES DRYER BROCHURE

ACME *Semi-Automatics* CUT COST!



4940

Left: ACME Type D-10 Semi-Automatic, with stroke . . . an oscillating machine used with conventional lathe for polishing and buffing out-of-round work of a larger size than handled by the Acme A-2-D. The stroke arrangement permits work to oscillate across face of wheel.

5010-2-9

Above: ACME Type B-10 Semi-Automatic with patented geared chuck arrangement used in conjunction with two ACME L-8L adjustable buffing lathes for finishing all four sides and top surface of rectangular or out-of-round parts in one operation.

CATALOGS ON REQUEST

for PROVED PERFORMANCE *install* ACME *Automatics!*

Nearly half a century of progressive experience in this specialized field of machinery design and building enables ACME to serve you efficiently with machines and arrangements that increase production and cut costs. ACME Automatics have an impressive background of proved performance in polishing, buffing, grinding, wire brushing, de-burring and micro-finishing. They have demonstrated their value in civilian and defense production on such operations as radius blending, armor plate grinding, thread clearing and automatic indexing of many operations as well as automatic polishing and buffing of all sizes and shapes of parts.

For recommendations, send blue prints of part or samples before and after finishing, together with detailed information on finishing operations and production requirements. If production methods will cut your costs, we can set your job up in our experimental processing department and you can inspect the machines in operation.

ROTARY STRAIGHT LINE SEMI-AUTOMATIC AND SPECIAL *Polishing and Buffing Machinery*

SPECIAL MACHINERY — AMC — AUTOMATIC BUFFING MACHINES

ACME *Manufacturing Co.*

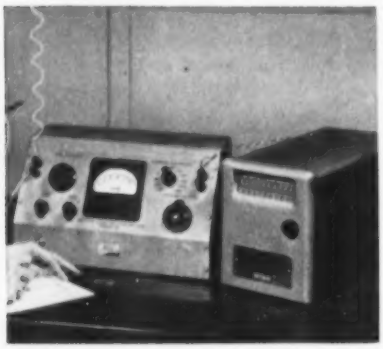
Builders 1400 E. 9 MILE RD., DETROIT 20 (Ferndale) MICH.

OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 432.

WE CUT OUR OWN ANALYSIS TIME BY MORE THAN 50%

right in our home plant!



We do a great deal of electro-plating at the Patent Button Company—not only on our own products, but also on contracts for many other firms—much of it to strict Government specifications. We plate with copper and zinc cyanide, cadmium, brass and nickel solutions.

Analyses in 20 Minutes!

Before we developed the Patwin C-1 Electro-Polarizer, we spent an average of 60 minutes in analyzing a typical solution by chemical methods. Now, with this instrument, analyses of very high accuracy are completed in 15-20 minutes! Our production has been speeded considerably, and we want to pass the news along to other electro-platers facing the same problem.

Top Quality! Low Cost!

The Patwin C-1 Electro-Polarizer needs only a standard 110 A/C outlet—comes in a steel case which takes up only 6 square feet of bench space—incorporates the finest components we're able to lay our hands on (the galvanometer, for instance, is GE's high sensitivity portable model)—and costs about $100 less than any other polaragraphic instrument we've ever heard of!

The Patent Button Company

PATWIN INSTRUMENTS Division
THE PATENT BUTTON COMPANY, Waterbury 20, Conn.

Please send me more information about your Patwin C-1 Electro-Polarizer.

NAME_____

FIRM_____

ADDRESS_____

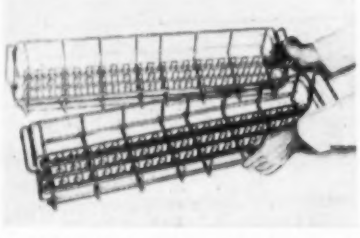
CITY_____ STATE_____

Equipment and Supplies

or cathode current densities obtainable. In addition to completely eliminating mist and spray, Zero-Mist also reduces film drag-out up to 50 per cent by virtue of its ability to lower the surface tension of the chromium plating solution.

This makes possible a total saving up to 70 per cent of chromic acid. Prior to the advent of Zero-Mist, records have shown that out of 100 lbs of chromic acid used in chromium plating, as little as 10 lbs actually may be used in the deposition of metallic chromium, the balance being lost as spray and drag-out. For more information on this product, use Reader Service Card.

E—426. Plastisol Aid to Jet Blade Manufacturer—Zinc tote baskets used in the trichlorethylene degreasing of jet blades at Utica Drop Forge & Tool Co., Clayville, N. Y., are now being coated with a plastisol formulated by the Stanley Chemical Co., East Berlin, Conn.



Trichlorethylene degreasing had previously posed a tough problem. Several ordinary plastisol coatings were tried in test runs, but the trichlorethylene always seeped underneath the coating and broke through the plastic.

The special plastisol, 77X-1078, provides proper protection where others failed against both trichlorethylene and perchlorethylene. The surface of this Stanley plastic is sufficiently hard and slick to afford rapid drain off and to minimize carry-over. A Stanley primer is used under the plastisol to provide maximum adhesion and added insurance against the trichlorethylene creeping underneath.

Complete information on this new product may be obtained by using Reader Service Card.

E—427. Exhaust Blowers For Corrosive Atmospheres—Two complete lines of exhaust blowers protected for corrosion and abrasion service have been announced by Heil Process Equipment Corp., 12901 Elmwood Ave., Cleveland 11, Ohio.

A compact, self-contained coated exhaust fan set, designed for services ranging from simple ventilating to handling of moderately corrosive atmospheres, has

Available for Immediate Shipment, Attractive Values

THE FOLLOWING EXCELLENT REBUILT AND GUARANTEED ELECTROPLATING MOTOR GENERATOR SETS AND RECTIFIERS, WITH FULL CONTROL EQUIPMENT:

PLATERS

1—7500/3750 AMPERE, 9/18 VOLT, **HANSON-VAN WINKLE-MUNNING**, Synchronous.
1—5000/2500 AMPERE, 8/16 VOLT **ELECTRIC PRODUCTS**, 25° C., Synchronous, Exciter-in-head.
1—5000/2500 AMPERE, 9/18 VOLT, **COLUMBIA**.
1—5000/2500 AMPERE, 8/16 VOLT, **CHANDEYSSON**, 25° C., Exciter-in-head.
1—5000/2500 AMPERE, 6/12 VOLT, **CHANDEYSSON**, 25° C., Synchronous, Exciter-in-head.
1—4000/2000 AMPERE, 6/12 VOLT, **CHANDEYSSON**, 25° C., Exciter-in-head.
1—3000/1500 AMPERE, 6/12 VOLT, **ELECTRIC PRODUCTS**, Synchronous, Exciter-in-Head.
1—2500/1250 AMPERE, 9/18 VOLT, **ELECTRIC PRODUCTS**, Synchronous, Exciter-in-head.
1—2000/1000 AMPERE, 8/16 VOLT, **ELECTRIC PRODUCTS**.
1—1500/750 AMPERE, 6/12 VOLT, **HANSON-VAN WINKLE-MUNNING**, Synchronous, Exciter-in-head.
1—1500/750 AMPERE, 12/24 VOLT, **CHANDEYSSON**, Synchronous, Exciter-in-head.
1—1000/500 AMPERE, 6/12 VOLT, **ELECTRIC PRODUCTS**.

ANODIZERS

1—4000 AMPERE, 40 VOLT, **CHANDEYSSON**, Exciter-in-head.
1—1000 AMPERE, 30 VOLT, **IDEAL**, Exciter-in-head.
1—1000 AMPERE, 40 VOLT, **CHANDEYSSON**, 25° C.
1—750 AMPERE, 60 VOLT, **HANSON-VAN WINKLE-MUNNING**, Synchronous, Exciter-in-head.
1—500 AMPERE, 25 VOLT, **CHANDEYSSON**, Synchronous, Exciter-in-head.
1—400 AMPERE, 40 VOLT, **M. G. C.**, Exciter-in-head.

RECTIFIERS

BRAND NEW BASIC RECTIFIERS, 1500/750 amperes, 6/12 volts. Special Price: $750.00 each. Separate Voltage Controls available.
1—2000/1000 AMPERE, 6/12 VOLT, **G. E.**, COPPER OXIDE, with Manual Control.
1—2000/1000 AMPERES 6/12 volt G. E., brand new selenium stacks, with "On-load" Automatic Voltage Regulator.
1—**GREEN SELECTOPLATER**, 1800 AMPERE, 12 VOLT, 220/3/60.
2—**UDYLITE-MALLORY**, 1500/750 AMPERE, 6/12 VOLT, Control.

SPECIAL

1—No. 200 **RONCI** LACQUER MACHINE.
1—**CROWN** 18 x 18 CENTRIFUGAL DRYER, Steam Heat.
3—No. 1 and No. 2 **HARTFORD** TRIPLE-ACTION BURNISHING BARRELS, Lined and Unlined, Belted.

Above is partial list only. Write to us for all your requirements for Plating, Anodizing and Metal Finishing

WIRE—PHONE—WRITE

M. E. BAKER CO.
25 WHEELER STREET
Klrkland 7-5460 CAMBRIDGE 38, MASS.

the finest stripper of all

is in a NORTHWEST drum

"Step right up Gentlemen, you ain't seen nuttin' yet."

And you haven't until you've seen Northwest's New Liquid Stripper #6 in action.

This high-speed baby really "peels" all organic finishes from steel, magnesium, and zinc die castings in one performance—no two, three, or four run-throughs before the work is ready for re-painting. The closest approach to a universal stripper yet developed.

Liquid Stripper #6 is Safe—no fire hazard, no odor, no fumes, non-toxic.

Liquid Stripper #6 is Sure—parts are fully cleaned—metal surface is unharmed—long life is assured—economy is proven.

Liquid Stripper #6 is Soluble—converts paint film to soluble form which can be rinsed off with a water spray—contains no chemicals which cannot be flushed through sewers.

Call your Northwest Cleaning Specialist about #6 and the other great Northwest Liquid Strippers for aluminum, silicones, and cold stripping.

Remember—YOUR COST PER FINISHED ARTICLE IS THE TRUE COST OF YOUR CLEANER.

LO HI pH

NORTHWEST CHEMICAL CO.

9310 ROSELAWN DETROIT 4, MICH.

pioneers in pH cleaning control *serving you since '32*

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 435.

Equipment and Supplies

blower capacities from 300 to 7000 cfm. For service with corrosive elements, units are supplied with either baked phenolic, vinyl or tough latex coatings to resist a wide range of chemicals including organic materials.

A complete line of heavy-duty rubber covered blowers for rugged service in severe corrosive or abrasive conditions has been made with blower capacities from 750 to 54,000 cfm. Complete engineering data and specifications can be obtained by using Reader Service Card.

E—428. Fire Safety Device—A new fire safety device which continuously indicates whether CO_2 fire extinguishers are full or empty and also saves considerable maintenance expense has been introduced by Mel-Rod Manufacturing Co., North Hollywood, Calif.

Known as the Silent Sentry, the device serves as both a mounting bracket and continuous weigher for all standard CO_2 fire extinguishers. A collar, included with the unit, fastens around the neck of the bottle permanently and permits instant use of the extinguisher.

Because the Silent Sentry shows the condition of the extinguisher at all times, it completely eliminates the element of danger which is always present between periodic manual checks. In addition, the indicator does away with all expense of manual inspection and weighing. For more information on this product, use Reader Service Card.

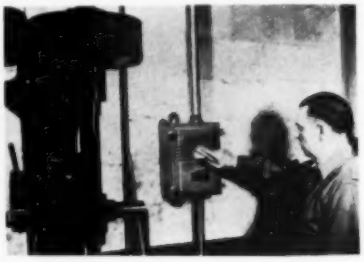
E—429. New Büchner Funnel—The same features of chemical resistance, light weight, and high impact strength which have won widespread acceptance of Agilene laboratory ware in industrial laboratories are now available in the new Agilene Büchner funnel. The funnels introduced by American Agile Corp., Bedford, Ohio are fabricated, by hot gas welding from components injection molded of high molecular weight, noncorrodible, virgin polyethylene. For more information on this product, use Reader Service Card.

E—430. Agilene Pipette Jars—New and novel types of Agilene containers are pipette jars now offered by American Agile Corporation, Bedford, Ohio, and recommended for use in washing or soaking pipettes.

Made of polyethylene, the jars are resistant to most acids, alkalis, and caustic and oxidizing cleaning solutions at temperatures below 175° F.

The light weight jars are easy to handle, their resiliency serves to minimize breakage of pipettes, and especially pipette points, during soaking or cleaning operations. For more information on this material, use Reader Service Card.

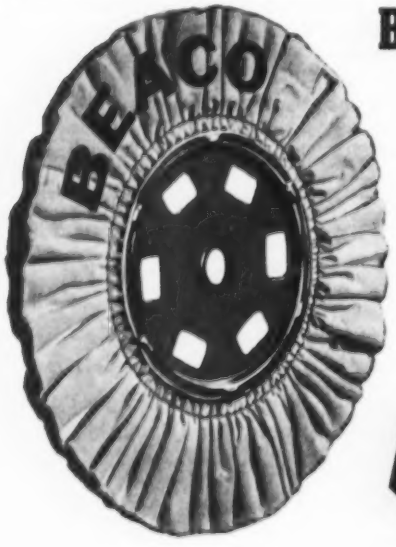
E—431. Lead-plated Enclosures—Lead-plated, sheet-steel enclosures for safety switches and circuit breakers—an



innovation in the electrical industry—are being produced by the Trumbull Components Department of General Electric of Plainville, Conn.

These new enclosures will find wide applications where humid, dust-laden and corrosive atmospheres prevail.

According to test data, the inert lead coating, unlike cast-iron surfaces, effectively resists the corrosive effect of acid, alkali and salt spray. The new lead-plated enclosures are much lighter than cast-iron types and therefore are much easier to handle and install. For more



BETTER BUFFING WITH BEACON

For every buffing need there is no better choice in wheels than *Beaco*. Offering superior performance, *Beaco* buffing wheels have proven themselves in engineering, wear, materials, workmanship and every other *quality that makes the difference.*

The perfect complement to *Beaco* wheels is the Beacon line of buffing compounds—*Vincite, Violet Ray* and conventional—with improved and quicker cutting and coloring for substantially higher production at less cost.

Write today for full information on buffs and compounds, or have our technical staff help you with specific requirements, without obligation.

Beacon plants in the East and Middle West

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BEACON SUPPLY CO.

110 Marginal St., Chelsea 50, Mass.

TWO NEW PLA-TANK DEVELOPMENTS REVOLUTIONIZE PLASTIC TANK FIELD

Vastly Increased Chemical Resistance at Higher Temperatures Extends PLA-TANK® Usefulness

The Chemical Corporation pioneered the use of fiber glass and polyester resin laminates for chemical resistant service. Sold under the Pla-Tank brand name, it was the first equipment made of this material. Now the company pioneers again.

The Chemical Corporation research and development program makes feasible a "prescription" type of formulation for specific problems. It is now literally possible for our technical service engineers to prescribe one of a number of vastly improved combinations of Pla-Tank material for liquid contact applications never before considered suitable for ordinary polyester plastics.

For example, tests prove that all new Pla-Tank electroplaters' tanks now offer far better performance on hot sulphuric, nitric, phosphoric and chromic acid solutions than any other commercially available fiber glass tank.

All Polyesters are not Alike

PLA-TANK achieves these vastly improved resistances by carefully controlled variations in either the resin or fiber or both. Although Pla-Tank material still starts with a basic polyester resin our research has developed means of improving its performance to include the best features of other types of resin while still retaining the "moldability" of the polyester. Now more than ever "all polyesters are not alike" and commonly published studies of polyester performance must not be applied to Pla-Tank Special Materials. Conversely Pla-Tank test results must under no circumstances be interpreted as indicating the performance of competitive materials.

Polyester resins derive their chemical resistance from 1) the make-up of the chain of alkyls and 2) the nature of the cross links between the reaction points of adjacent alkyl chains.

After an intensive research and testing program covering thousands of samples, Pla-Tank development labs have isolated and selected those alkyds which show highest chemical resistance to various specific agents and matched them with the most effective cross links.

Only an organization well versed in the Chemical Field, with the foresight and financial ability to underwrite a costly research program such as this, could bring forth these results. When you specify "PLA-TANK" brand material you automatically receive the benefit of this program and future developments which it can be expected to produce.

PLA-TANK "Integral-Molding"— New Concept of Molding Technique Makes Other Plastic Tanks Obsolete

PLA-TANK — the pioneer fiberglas and resin tank for chemical-resistant use — is now different from any other plastic tank on the market! A startling new development of our research and development laboratory has overcome the major problem in this field by perfecting a precise control system for the catalytic heat used to cure these reinforced plastics.

Truly "One-Piece" Construction

This controlled exotherm means that now every Pla-Tank tank is laid up, ply on ply, around corners, along edges while the resin is still in its wet state. The entire tank is complete — then it all cures at one time. No longer must you accept a tank where thick corner sections are "over-cooked" to a point of brittleness. No longer must you be satisfied with undercured thin wall or bottom panels which bulge from incomplete development of rigidity. No longer should you consider a "stuck-together" assembly of building-block sheets and angles which flaunts the basic principles of resin reinforcement. No longer can you afford to take less than the *best* the industry offers — genuine PLA-TANK quality tanks for electroplating or chemical solutions.

Standard Sizes — Quick Deliveries

Over 275 standard sizes, ranging from 8″ x 8″ x 10″ up to 192″ x 36″ x 36″ offer a wide choice for virtually every need, without involving mold charges. Cylindrical tanks, square or rectangular tanks, tapered or straight-sided tanks are all listed for quick shipment. For non-standard tanks or containers and for overflow dams, outlets or sumps send drawing for quotation.

P-17

THE *Chemical* CORPORATION

57 WALTHAM AVENUE, SPRINGFIELD 9, MASS.

information on the units, use Reader Service Card.

E—432. Reconditioning Plant Equipment by Wet-Blasting—With scores of parts in plant equipment requiring periodic cleaning, plant engineers have had reason to look for mechanical methods of accomplishment. Parts need to be freed of carbonaceous scale, rust, and other surface contaminants to avoid plugging up.

The cleaning problem is made more difficult because many of the parts are built to close tolerances.

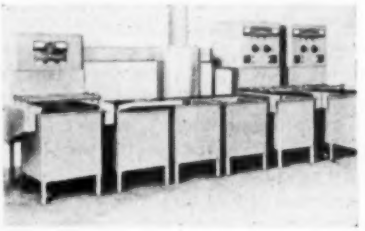
In an effort to decrease maintenance costs and speed processes up, many engineers have turned to the wet-blasting process. This process consists of throwing water-suspended abrasives at the work by compressed air, and as such, is particularly appropriate for cleaning problems where holes, pockets, and other recesses make it difficult to reach the contaminants and remove them. Cleaning is rapidly accomplished, and all areas on a part receive the same uniform finish. Surface abrasion, however, is easily controlled since fine-mesh abrasives are used. For more data on this process use Reader Service Card.

E—433. Emulsion Cleaners—Development of a complete line of seven emulsion cleaners was announced recently by Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1P, Calif.

These emulsion cleaners, according to the manufacturer, offer a very simple spray-on method of removing grease and oil from metals and machinery. Added in small amounts to petroleum solvents, the cleaners act with these solvents like soap acts with water . . . they increase the penetrating power of the solvents . . . speed the cleaning action . . . improve the rinsing properties.

Materials included in the Turco line are: Airmulso, Mulsine, Mulsirex, Emulsit, Turco-Klene, Emulsoil, Borzin. For more data on the new cleaner line, use Reader Service Card.

E—434. Precision Hard Chromium Plating Unit—The exclusive features of the Morey Process for precision hard



chromium plating have been incorporated in a packaged precision unit by Wagner Brothers, Inc., 425 Midland Ave., Detroit 3P, Mich.

It now enables one to set up complete plating facilities for on-the-spot chromium finishing of production tools and parts. Many jealously guarded trade secrets and operating techniques have been engineered into an exact science of control and procedure which now permits the inexperienced operator to do the extremely precise and seemingly impossible plating jobs formerly left only to the "experts," state the manufacturers.

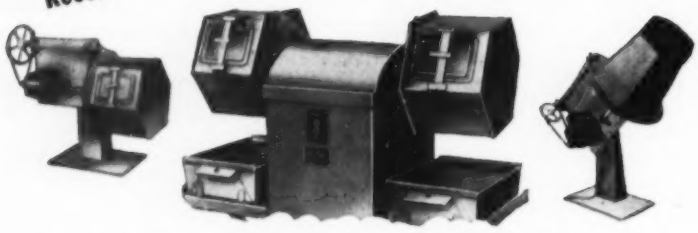
All equipment needed for a complete hard chromium department is furnished: 6 tanks, lead and Neoprene tank linings, 5 rectifiers, a fume separation system, heat and timing controls and electrical connections ready for immediate installation. An intensive course of instruction in the advanced phases of precision plating is offered as a part of the process. For more data on this equipment, use Reader Service Card.

E—435. Pouring Spout for Small Containers—The GS type SO pouring spout announced by General Scientific Equipment Co., 2700 W. Huntingdon St., Philadelphia 32, Pa., provides a safe and easy method of pouring liquids into smaller containers.

It is designed to prevent accidents and to save materials, caused by spilling, splashing and carelessness in pouring liquids into smaller containers.

The new safety vent pouring spout fits bottle openings from 1 to 1⅜ inches and has a flow capacity of slightly more than 1 gpm. For complete information, use Reader Service Card.

CASE HISTORIES
Prove Protective Superiority of
Proof from the Record
MUNRAY PLASTISOLS



PC-11 COATED TUMBLING BARRELS have
High Chemical and Abrasion Resistance

When The Rampe Manufacturing Co., Cleveland, Ohio, were perfecting their line of Tumbling Machines they came to us for advice as to how best to coat their barrels for chemical and abrasion resistance. Working with them our engineers developed the proper procedure for coating their barrels with PC-11 Heat Converted Plastisol. The enthusiastic reception of their equipment has fully proved the superiority of the Munray Plastisol Coating.

PC-11 is highly resistant to a variety of reagents—it has high tensile strength making it resistant to rough handling—it requires only one primer and one finish coat (heat converted) for a tough, rugged, scuff resistant, permanently flexible insulation.

Write for complete information and recommendations about the use of PC-11 on your products and equipment.

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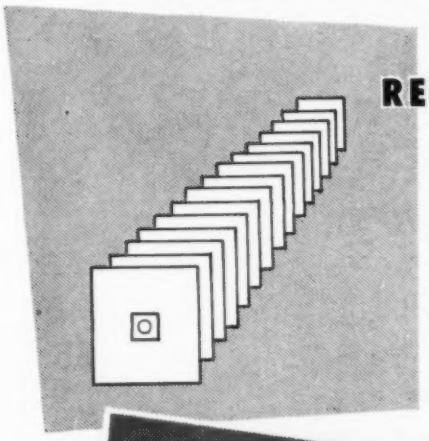
The Price of Quality

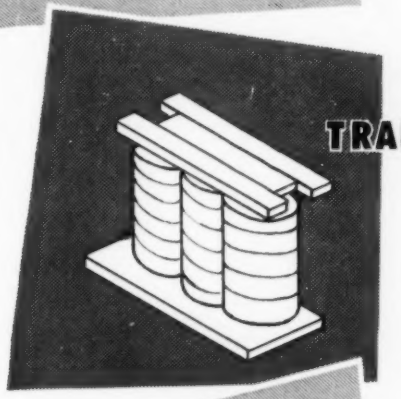


RECTIFIER PLATE ASSEMBLIES

Most people do not know that many different grades of selenium rectifier plates are available—*even from the same manufacturer.* The highest grades have the lowest forward drop and the lowest inverse current. Assemblies of these plates are made to meet Green Electric specifications and are individually measured before acceptance. There is also a choice among several protective finishes. The best finish uses several coats of different materials individually dipped, spun, and baked. This finish, which is approved even for marine use, is best applied with the special machinery in the plate manufacturer's plant

Munning-Green rectifiers use only the best plates with the best finish

YOU GET WHAT YOU PAY FOR

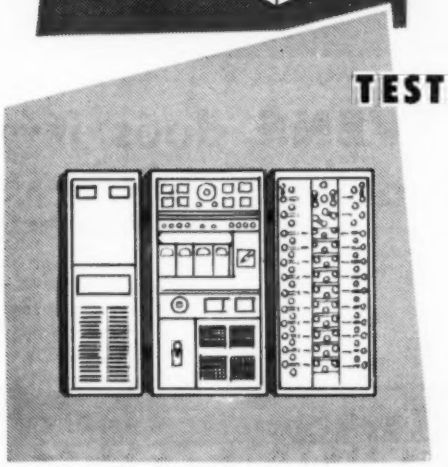


TRANSFORMERS

Here's a surprising thing—if each of the three dimensions of a transformer is cut by only 10% the reduction is hardly noticeable to the expert eye, especially if the shape is changed, but the rating and the cost shrink by nearly 30%.

Lifetime transformers are bigger than cheap transformers.

YOU GET WHAT YOU PAY FOR



TESTING

Should a rectifier be load-tested?

Do you know that many rectifier units are *not* load-tested before shipment and that some rectifier manufacturers do not have adequate test equipment nor adequate power capacity?

Every component used in Munning-Green rectifiers is individually tested for acceptance before assembly.

Every Munning-Green rectifier unit is tested at several assembly stages.

Every Munning-Green rectifier unit is tested and measured at full load before release for shipment

Adequate testing takes time and money, provides insurance for the customer.

YOU GET WHAT YOU PAY FOR

QUALITY
Costs More

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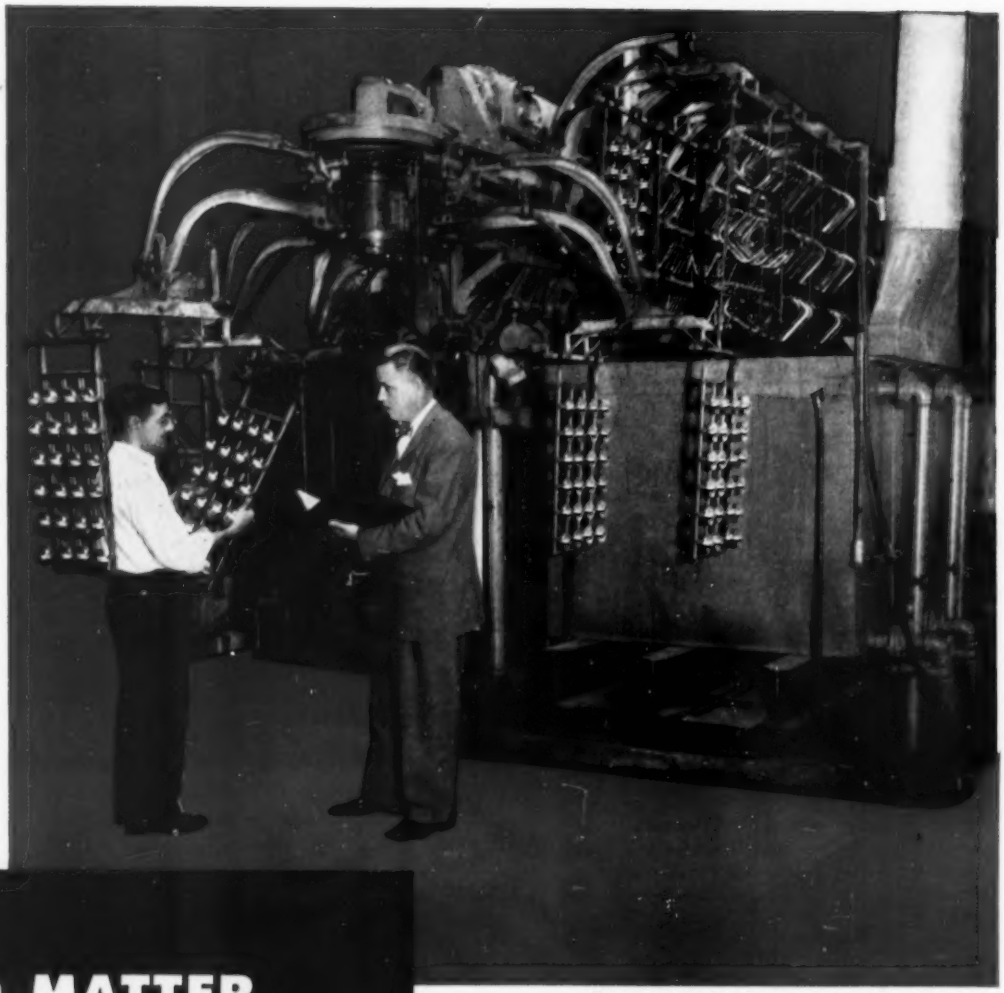
MUNNING & MUNNING INC.

202-208 EMMET STREET, NEWARK, N. J.

(Sales offices and distributors in principal cities)



Stevens Model "A" Automatic Plating Machine

"NO MATTER WHAT THE JOB . . . STEVENS does it— and does it *better!*"

That's the report of the New England Plating Co., Worcester, Massachusetts. At present, New England Plating has 2 Stevens machines in operation. With this equipment, they do nickel plating and dichromating automatically—quickly—economically!

These Stevens Automatic Plating machines have launched the New England Plating Company on an entirely new phase of the company's history. They are contemplating the installation of still a third Frederic B. Stevens machine in the near future.

Let us help you with your plating problems. Call a Stevens technical representative – there's one in principal cities – or write direct. FREDERIC B. STEVENS, INC., DETROIT 16, MICH.

STEVENS

EVERYTHING FOR METAL FINISHING

BRANCHES: **BUFFALO • CLEVELAND • INDIANAPOLIS • NEW HAVEN • DAYTON**
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plating

APRIL, 1954

Dedicated to the improvement and dissemination of the knowledge of the arts and sciences of electroplating and of finishing of metals and of allied arts.

VOL. 41, No. 4

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This month's cover is from a photo of rhodium plated metal reflectors at the plant of Heyer-Shultz, Inc., Cedar Grove, N. J.

Published by the American Electroplaters' Society. Publication Office: 5800 N. Marvine Street, Philadelphia 41, Pa. Phone: LIvingston 8-7800. Editorial, Advertising and Executive Offices: American Building, 445 Broad Street, Newark 2, N. J. Phone: Humboldt 2-3400. Subscriptions: Domestic and Canada, $4.00 for 1 year; $7.00 for 2 years; 50c per copy; Foreign, $8.00 per year; $1.00 per copy.

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PLATING is abstracted regularly in Chemical Abstracts, Metals Review, Metallurgical Abstracts, Engineering Index, Technical Data Digest and Bulletin Analytique.

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Editorial

Nickel, Nickel, Who Gets the Nickel?

THE LONG PERIODS of prosperity which have blessed the American scene have reached a point which may be described best by the use of a term in plating—leveling. Ahead is a period of "hard selling" for goods and services for most industries, including that of metal finishing.

The plater's lot is made more complicated with the extra burden of the nickel supply situation. Nickel sulfate and nickel chloride have been reported to be scarcer than at any time in over a year. Nickel anodes, since allocations were lifted in November, 1953, are even more scarce.

One source has predicted that nickel for civilian electroplating will be harder to get than in 1952 when many items were on the nickel plating "prohibited list."

Regular suppliers are doing the best job they can, under existing government regulations, to maintain an equitable distribution of their supplies. The regulations, however, are working to the extreme hardship of a good segment of the metal finishing industry. Platers, up until now, have accepted the restrictive orders, but have reached a point where they cannot afford to remain silent. Too many questions need honest answers.

During the control period reports show that one industry received about 116 per cent of pre-Korea amounts of nickel, another about 133 per cent and the electroplating group only 39 per cent. After decontrol it appeared that the picture would change and that metal finishers would get a larger share of the metal. Instead of a larger share, however, the government has decreed lesser amounts to the electroplating industry.

A big "WHY?" cannot be denied after one reads government releases that cite record-breaking nickel production figures.

Too many field reports indicate that nickel "may be had at a price—two dollars and more per pound," in the black (nickel) market.

The old adage of the "squeaky wheel" is recalled. It appears that the only way the plating industry will get its fair share of the critical metal is through deliberate, persistent and loud complaints to the proper authorities by more and more platers.

Al Korbelak

CURRENT DENSITY DISTRIBUTION IN ELECTROPLATING BY USE OF MODELS

GILBERT FORD KINNEY* and JOHN V. FESTA†

Abstract

An electroplated metal is deposited as a result of the electric field set up in the plating bath. It is difficult to describe analytically the field about an electrode of irregular shape but control of the field is essential if uniform electroplate is to be obtained. This paper describes a method of utilizing models in the study of these electric fields. Measurements of relative current density are thereby readily made for a variety of practical electroplating situations. These measurements give the primary current distribution which would be observed if polarization and anode and cathode surface phenomena are not taken into account.

Introduction

The practical electroplater must control not only the appearance, but also the distribution, of the metal deposited on an object in order to produce acceptable work. At constant efficiency the amount of metal deposited per unit time is directly proportional to the current density at each point; therefore, a nearly uniform distribution of the current density is required to obtain a deposit of uniform thickness. Methods by which the current distribution can be controlled include (a) proper positioning of the object to be plated in relation to the anodes, (b) proper location of contact points, particularly for objects with appreciable resistance, (c) use of an auxiliary anode to build up thickness at a thin spot, (d) use of an auxiliary cathode or thief to reduce current density in some particular region, (e) use of nonconducting shields to throw the deposit to another area, and (f) manipulative techniques which enhance the throwing power of a solution. The problems are very complicated and have no exact solutions. Intuition and experience are helpful in finding the best compromise among a series of conflicting demands, and the design of even the simplest type of plating rack becomes something of an art. Part of this art lies in proper integration of all of the many factors which influence the distribution of the electrodeposited metal.

The distribution of the electric current about an object, and hence the resulting thicknesses of electroplate on its surface, depends on the electric field set up in the conducting plating solution. The characteristics of this electric field are important for, *in principle*, if the electric potential is known as a function of position throughout the solution, the electroplating problem is completely solved. For certain simple geometric shapes electric-field configurations have actually been computed using the Poisson and Laplace equations. These mathematical solutions parallel those for the same types of fields found in problems in hydrodynamics, aerodynamics, or heat transfer. The immediate application of these methods to electroplating was made by C. Kasper in a series of papers[1] in which he provided algebraic solutions for the current-density distribution to be anticipated with various line and plane electrode assemblies. The advanced nature of the mathematics employed for even the simplest electrode assemblies makes it evident that such methods are less than convenient when extended to complicated shapes. Yet it is the irregular shape that is of practical concern to the electroplater; an example is the rod stock for an experimental vacuum tube, sketched in Fig. 1. The purpose of this paper is to indicate how the primary current-density distribution, and hence the relative thickness of plated metal, about such a rod can be predicted from simple measurements made on a model.

General Theory

The electric field in an electroplating tank may be represented by equipotential planes and by current-flow planes. The two systems of planes are complementary and combine to give a complete orthogonal field. Consider those elements of a three-dimensional field that lie in a single plane, as, for example, in a

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†Electronics Division, Sylvania Electric Products, Inc., Mountain View, Calif.

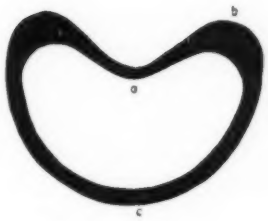

Fig. 1. Cross section of plated rod. Thickness of plating least at **a**, *greater at points such as* **b** *and* **c**

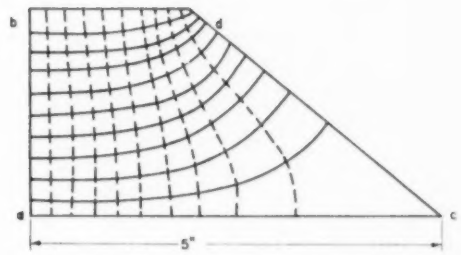

Fig. 2. Electric current field in Hull Cell. Electrodes **ab** *and* **cd** *are connected by (solid) current lines; equipotential lines are dotted*

tank with vertical electrodes, or as in a Hull cell. The Hull cell is a miniature test-plating tank with inclined electrodes shown as ab and cd in Fig. 2, and is used by electroplaters to check performance of plating solutions over a wide range of current densities. The two-dimensional field plot shown in Fig. 2 consists of two complementary sets of lines which intersect everywhere at right angles. One set of lines, dotted in the figure, represent lines of equal potential at values intermediate between those of the two electrodes ab and cd.

The equipotential lines of the figure were obtained on a model (2X size) of the actual cell, in which conducting paper is used to simulate the conducting solution. For electrodes, low-resistance strips of silver paint, of the type supplied for printed circuits, were applied to the paper and dried with an infrared heating lamp. Electrodes of resistivity less than one ohm per square are easily prepared, and this resistance is negligible compared with that of the paper. Conducting paper for representing solution is available in several types. One grade of facsimile paper* supplied in 12 x 18 inch sheets shows quite uniform resistivity of about 7500 ohms per square. This facsimile paper carries an aluminum surfacing which may be disturbed by the vehicle of the conducting paint, but this can be avoided if care is used in preparation of the model.

In determining the field, a potential difference is applied across the electrodes of the model by use of a voltage stabilizing transformer, a variable autotransformer, and a dry disc battery charger. Fig. 3 indicates the circuit schematically. Points on the intermediate potential lines were located by using a probe connected through a galvanometer to a decade voltage divider.† A null reading on the galvanometer indicates a selected fraction of the total potential difference of one or two volts, and a galvanometer of sensitivity of about 10^{-8} amps/mm allows precise location of equipotential lines. (This technique parallels that for the Analogue Field Plotter of the General Electric Company.)

Current flow in the Hull cell is represented in Fig 2 by solid lines which connect electrodes ab and cd. These lines form so-called curvilinear squares with the dotted equipotential lines, the two sets of lines intersecting each other always at right angles. This observation offers one means of locating the current-flow lines graphically: after the equipotential lines have been plotted, the current flow lines are drawn in by inspection to meet the right-angle curvilinear-square requirements.[3] More elaborate field-plotting devices can be used in which the right-angle direction is located experimentally by means of two additional contacts on the null probe. After a point on an equipotential line is located, the probe is rotated until maximum voltage difference is observed between the two auxiliary contacts. The line joining them then gives the right-angle direction.

An alternative method of locating the network of current flow lines is one which "inverts" the model. An inverted model is one in which the conducting electrodes of the original model are replaced by nonconducting areas, and, conversely, the nonconducting areas are replaced by conducting areas. The current lines of the original model become the equipotential lines of the inverted model and are easily located by the null-probe technique. The current lines drawn in the figure of the Hull cell were obtained by this method. The inverted model uses electrodes along lines ac and bd, and the lines ab and cd become edges of the conducting paper. Fig. 2 is thus a composite.

Current-Density Measurement

The above considerations concerning orthogonal fields are well known. It remains to extend them to cover the item of primary interest to the electroplater,

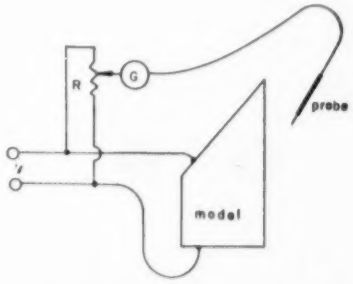

Fig. 3. Locating equipotential lines

*Type NDA, Time-Fax facsimile paper supplied by Times Facsimile Corp., 540 W. 58th Street, New York, N. Y.

†The unit used by the authors was manufactured by the General Radio Co., Cambridge, Mass.

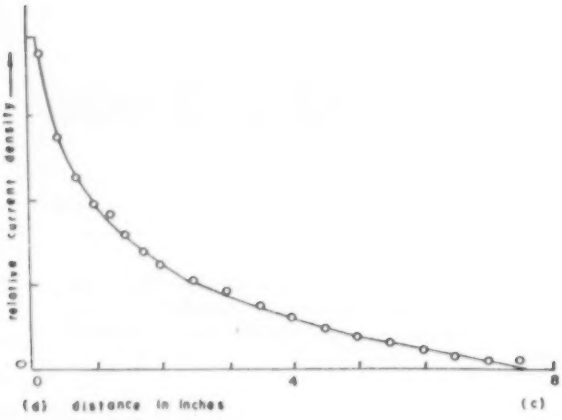

Fig. 4. Current distribution at cathode of Hull cell. Circled points obtained from inverted model; solid line shows accepted values

the current distribution along the electrodes. The current density at each point is reflected in the spacing of the current flow lines; closer spacing, as near d of electrode cd of the Hull cell, corresponds to greater density of current, i. e., potential gradient in the inverted model corresponds to current density in the original model. This potential gradient can be obtained from measurements on the inverted model by plotting relative potential of the equipotential lines versus their position. The slope of this plotted line at any point is the potential gradient at that point and also gives the relative current density for the original.

A convenient method of measuring potential gradient directly is by means of a two-contact probe. The voltage difference across two contacts will increase with increasing gradient and give a value which closely approaches that of the actual gradient at the midpoint between the two reasonably close contacts. A probe with two contacts about 5 millimeters apart gave voltage differences that were readily measurable when a voltage drop of 10 volts or less was placed across the electrodes of an inverted model some 8 to 10 inches across. Measurement by the Poggendorf compensation method, using a "portable" potentiometer and external galvanometer* of about 10^{-8} amp/mm sensitivity, eliminates the effect of variable contact resistance. The gradients measured in this manner along edge cd of the conducting paper of the inverted model, multiplied by a constant of proportionality, are shown as circled points in Fig. 4. The solid line is a plot of the accepted empirical relationship for the Hull cell, where relative current density = 27.7 − 43.7 log L, and L is the distance in inches along the inclined electrode from point d. This equation does not necessarily hold for all plating solutions and fails at the ends of the Hull-cell panel. However, it can be seen that the measurements on the inverted model reproduce almost exactly the accepted experimental values.

Measurements on a model representing cylindrical electrodes serve as a further check on the inverted model method, the uniformity in various directions of the conducting paper, and the suitability of painted electrodes. The electric field about such cylindrical electrodes is shown graphically in Fig. 5 and also can be described analytically.[1,2] Details of preparation of the model are as follows:

(1) A direct two-dimensional model is made, with conducting paint used to represent the electrodes. Areas a and b of Fig. 5 represent cylindrical electrodes.

(2) An equipotential line enclosing the electrode of interest is located by using the field-plotting and galvanometer-null technique. Line cdec is such an equipotential line about electrode a.

(3) A line of current flow is located by its right-angle relationship to intermediate potential lines drawn in for this purpose. One such is line acb. A straight line connecting points of closest approach of the two electrodes is also such a line, and might have been used. The point of closest approach, however, is a point of maximum current density at which measurements may particularly be desired, and it is preferred not to cut along this line. Hence, a line such as acb is used.

(4) An inverted model is then prepared in which the electrode of interest (electrode a in this case) becomes a nonconducting area in the con-

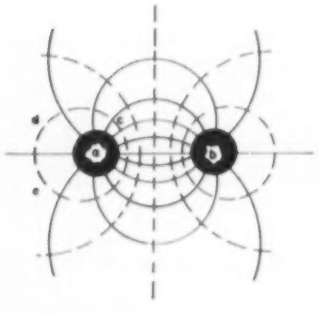

Fig. 5. Electric current field about cylindrical electrodes ***a*** *and* ***b****. Solid lines show current flow, dotted lines show equipotentials. Note that equipotential line* ***cdec*** *also could be an electrode without changing external field*

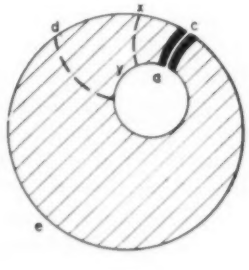

Fig. 6. Inverted model of electrode ***a*** *and area* ***cdec***

*The unit used by the authors was manufactured by Leeds & Northrup Co., Philadelphia 44, Pa.

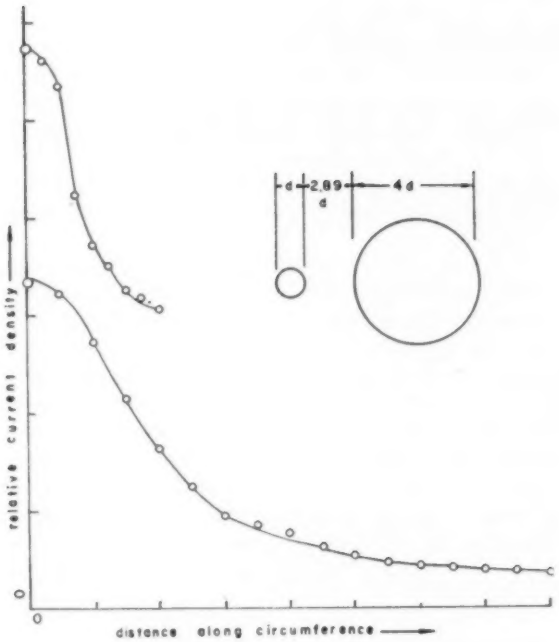

Fig. 7. Relative current density about cylindrical electrodes of diameters **d** *and 4***d** *separated by distance 2.89***d**. *Circles points were measured on inverted model; solid lines show theoretical values*

ducting paper. It is cut out and removed. The electric field to be studied, including the area representing electrode a, is then cut out by following the contour of equipotential line cdec. This has become a flow line in the inverted model, and no current flows across it. Severing the conducting paper along this line has no effect on current distribution. It does, however, give an inverted model of manageable dimension. The two sides of current line ac are then painted in with conducting paint, and the paint is allowed to dry. Cutting the paper along this line provides two electrodes for the inverted model, as shown in Fig. 6.

(5) The potential gradient along the edge of the cutout area representing the original electrode is measured, using the two-contact probe. These readings are proportional to the relative current density to be expected at each point.

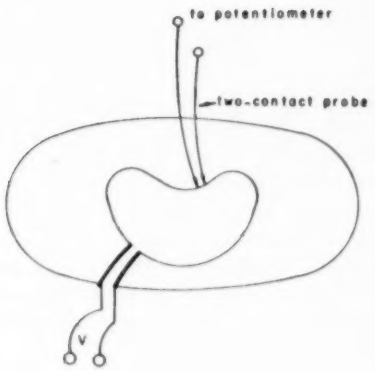

Fig. 9. Inverted model with cutout area representing rod

Values of the potential gradient around the two electrodes of Fig. 7 as measured in this manner (multiplied by a proportionality factor) are plotted as circled points in that figure. The theoretical values computed using accepted field equations are plotted as solid lines. The agreement between the theoretical and the experimental values indicates that the method is a satisfactory one. For the electrodes shown in Fig. 7 the theoretical ratio of maximum to minimum current densities becomes 2/1 and 10/1, respectively. The ratio of the two average current densities is 4/1, that of the maximums 1.789/1.

Figs. 8 and 9 show the two models used for measurements on the rod stock of Fig. 1. The measured values are plotted in Fig. 10 as open circles. Then, for

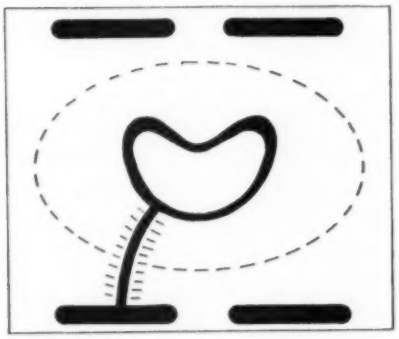

Fig. 8. Direct model of rod in plating tank with four anodes. Experimentally found equipotential lines are dotted. Solid current line connects rod and one anode

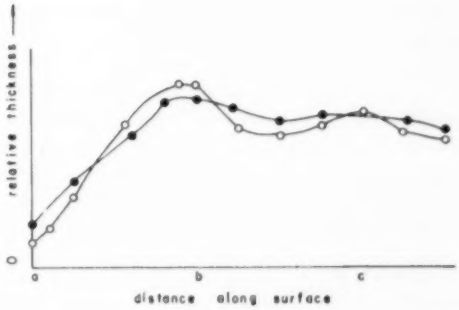

Fig. 10. Measured thickness of copper plate on rod shown as solid circles. Current density as measured on model shown as open circles. Discrepancy shows leveling action of solution throwing power

comparison purposes, a test length of this rod was copper plated in a "high-speed" copper bath (average current density, 40 amps/sq ft; time, 22 minutes; average thickness, 0.0016 inch) and flashed with nickel for protection. The rod was sectioned, polished, and etched by means of metallurgical techniques, and the plating thickness was measured microscopically with a filar micrometer. The results for various sections were averaged and the averages are plotted as solid circles in Fig. 10. The discrepancy between plating thickness and the measured potential gradient shows the effect of the throwing power of the high-speed copper bath.

Conclusion

The method of the inverted model also permits study of the effect of solution throwing power. Measurements are easily made to find the effects of electrode orientation or placement, or the behavior of auxiliary anodes or cathodes. An auxiliary anode becomes, in the direct model, a conducting area connected in parallel with the other anodes; an auxiliary cathode (thief) is connected in parallel with the object to be plated. The equipotential and current lines are located as described previously, but their positions are markedly affected by auxiliary electrodes. When the inverted model is prepared, each electrode becomes a cutout area.

A nonconducting shield about a portion of an object to be plated is represented by a cutout area in the original model. Location of equipotential lines and a line of current flow proceeds as before except that in the inverted model the shield becomes a conducting area not connected directly to an electrode. This conducting area shows, of course, a zero potential gradient corresponding to zero current density and no metal deposited.

These aspects, important as they are, are but one part of the electroplating problem. Polarization serves to modify the primary electric fields described here, but this approach to the problem permits the individual effects of polarization and of the primary field to be resolved. Furthermore, this study is limited to the effect of the primary field on thickness of deposited metal, and is not pertinent to questions of adhesion, appearance, or homogeneity. A general attack on all of these problems is, however, greatly facilitated by removing the effect of the geometry of irregular electrodes on primary electric field from the realm of speculation.

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[2]S. S. Attwood, "Electric and Magnetic Fields," John Wiley and Sons, Inc., N. Y. (1941).

● ● ●

Grades of Lead*

Chemical lead is a grade of commercial lead that has found wide acceptance within the chemical and process industries. This grade of lead contains by specification small amounts of silver and copper.

Acid lead is wholly refined lead alloyed with minute percentages of other elements, including copper, added specifically to improve resistance to corrosive attack.

An attendant advantage of these elements is diminution of the tendency of the lead to "creep." The latter is defined as continuous change of shape (length) with time when a load is applied. This load may be the weight of the lead itself and other loads, e. g., the solution in a tank.

Antimonial lead, commonly called "hard" lead, is lead alloyed with antimony (usually 6 per cent) to increase mechanical properties markedly at temperatures below 200° F.

At temperatures below 200° F antimonial lead has better abrasion resistance than chemical lead. At room temperatures it has twice the hardness and tensile properties; this makes it useful in tank construction, particularly where only a skeleton frame is used for support or where blows from harder metals are likely to be encountered.

Since the addition of the antimony lowers lead's melting-point, antimonial lead is not suitable for use at temperatures exceeding 200° F. Above that temperature both mechanical strength and corrosion resistance fall off rapidly.

Tellurium lead is a chemical lead to which has been added a fraction of a per cent of tellurium for added resistance to fatigue due to vibration. Tellurium lead has the ability to work-harden, that is, to strengthen itself under strain.

*From *Lead Handbook for the Chemical Process Industries (1954)*, Federated Metals Division, American Smelting and Refining Co., New York 5, N. Y.

TENTATIVE RECOMMENDED PRACTICE FOR PREPARATION OF COPPER AND COPPER-BASE ALLOYS FOR ELECTROPLATING*†

ASTM Designation: B281-53T Issued, 1953‡

This Tentative Recommended Practice has been approved by the sponsoring committee and accepted by the ASTM in accordance with established procedures, for use pending adoption as standard. Suggestions for revisions should be addressed to the ASTM, 1916 Race Street, Philadelphia 3, Pa.

Scope

1. (a) This recommended practice is intended as an aid to platers in setting up a suitable cleaning and conditioning cycle preparatory to electroplating on copper and copper-base alloys. It is not intended as a standardized procedure and should be used merely as a guide. The sequence of the individual cycles and the concentrations of the various solutions are flexible and may be varied to fit the conditions of the individual plating department. The purpose of the cycles is to prepare the work to take a sound, adherent electroplate.

(b) The wide variety of methods of mechanical (or abrasive) and chemical finishing are not considered strictly as preparation for plating and consequently are described only briefly.

(c) Details of plating and subsequent treatments are not within the scope of this recommended practice.

Preparation of Surface

2. (a) Removal of Oxides—The removal of oxides from cast, annealed, or heat-treated copper and copper-base alloys can be accomplished by abrasive methods such as tumbling, burnishing, emery set up wheel polishing, sand blasting, buffing, and greaseless compound buffing, and by chemical methods, such as pickling, bright dipping, "fire off" or scale dipping and cyanide dipping. The choice of methods is dependent on the resultant surface finish required and on the amount and type of oxide to be removed.

(b) Castings and Forgings—Castings and forgings requiring abrasive methods to produce a desired surface finish do not necessarily need pickling or bright dipping. However, if pickled or bright dipped, castings and other porous parts should be treated carefully to avoid stain spots; these products must be rinsed very thoroughly between operations in hot and cold water. Water repelling organic dips also are useful in removing residual chemicals which might cause staining. Wetting agents, which are in many proprietary products or may be added by the individual, usually require greater care in rinsing.

(c) Stampings and Drawn Products—Stampings and drawn work follow the same rule, as castings and forgings, except that for economic reasons it may be advisable to pickle before abrasive finishing if heavy oxides are present due to annealing. For example, excessive amounts of compounds or wheels may be consumed for removing oxides in the buffing operation before the actual work of smoothing the surface begins.

(d) Screw Machine Products—Screw machine products may be plated as they come from the machines, or abrasive finishing methods may be applied.

(e) Cold-Headed and Multiple-Plunger Press Products—Cold-headed products and multiple-plunger press machine products often require relief annealing to avoid subsequent season cracking. This annealing leaves some oxides which can be removed by pickling.

(f) Powdered Metal Parts—Powdered metal parts require special handling and will not be discussed in this recommended practice.

Solution Maintenance and Cleaning

3. Successful electropleting on copper and copper-base alloys is dependent primarily on proper and efficient cleaning during the conditioning cycle just prior to plating. Contamination of the successive solutions

*Under the standardization procedure of the ASTM, this recommended practice is under the jurisdiction of the ASTM Committee B-8 on Electrodeposited Metallic Coatings.

†Published through arrangement with the ASTM, Philadelphia, Pa.

‡Accepted by the ASTM at annual meeting, June, 1953.

and the plating bath should be guarded against by adequate rinsing of work. In many cases, because of limitations imposed, two rinses between acid dips and plating solutions should be used. Very serious thought must be given the problem of rinsing, because improper rinsing can be the source of many and varied plating problems. Some reliable means of control for maintenance of solution concentration should be set up. A regular routine of replacement of solutions should be established by experience.

(b) In regard to the number of cleaning stages or the thoroughness of the cleaning, it should be understood that work which is not clean will not plate satisfactorily. The cleaning done should be complete. The surface should be as chemically clean as possible and show no water breaks even after acid dipping and rinsing.

Spotting Out

4. "Spotting out" may occur after castings have been plated. This is usually due to porosity in the castings and inadequate rinsing between the various steps of the cycles. Acid or cyanide solutions may be retained in the pores of the metal. To help in the removal of cyanides or acids from the pores, several alternate hot and cold rinses are used, allowing the work to come to the temperature of the water before each removal. The most satisfactory method of eliminating this troublesome defect is to eliminate the cause —porous basis metals.[1]

Safety Precautions

5. Proper precautions as to safety must be taken. Acids should not be mixed with or carried into cyanides. Bright dips should be cooled and contained in such a manner as to insure against injury to personnel if the vessel breaks. Vapor degreasers must be properly operated and extreme caution used when entering an empty machine.

Outlines of Preparatory Cycles

Buffed Work

6. (a) Following is a typical cycle to be used for plating copper and copper-base alloys which have been buffed and are to be plated in an acid solution such as bright nickel:

(1) Vapor or solvent degrease (if heavy soil is present) or alkaline or emulsion soak clean,
(2) Rinse,
(3) Alkaline electroclean,
(4) Rinse (Note 1),
(5) Dip in acid,
(6) Rinse, and
(7) Plate in acid solution.

Note 1—A cyanide dip and rinse may be used to advantage between steps (4) and (5).

(b) Following is a typical cycle for buffed work to be plated in an alkaline solution:

(1) Vapor or solvent degrease (if heavy soil is present) or alkaline or emulsion soak clean,
(2) Rinse,
(3) Alkaline electroclean,
(4) Rinse (Note 2),
(5) Dip in cyanide solution,
(6) Rinse, or copper strike and rinse, and
(7) Plate in alkaline solution.

Note 2—An acid dip and rinse may be used to advantage between steps (4) and (5).

(c) Following is a cycle for buffed and soldered parts or screw machine work of leaded alloy to be plated in acid solution:

(1) Vapor or solvent degrease (if heavy soil is present) or alkaline or emulsion soak clean,
(2) Rinse,
(3) Alkaline electroclean (cathodic),
(4) Rinse (Note 3),
(5) Dip in cyanide solution (Note 3),
(6) Rinse (Note 3),
(7) Strike in copper (cyanide) (Notes 3 and 4) or low *p*H nickel electrolyte (Note 3),
(8) Rinse,
(9) Dip in acid,
(10) Rinse, and
(11) Plate in acid solution.

Note 3—A dip in fluoboric or dilute nitric acid, followed by a rinse, may be used to advantage between steps (4) and (5) if a copper strike is used, or in place of steps (5) and (6) if a nickel strike is used.

Note 4—A cyanide solution should not be allowed to accumulate lead, which may cause lead immersion plate with subsequent blistering.

Bright Dipped or Pickled Work

7. (a) Following is a typical cycle for work to be plated in acid solutions:

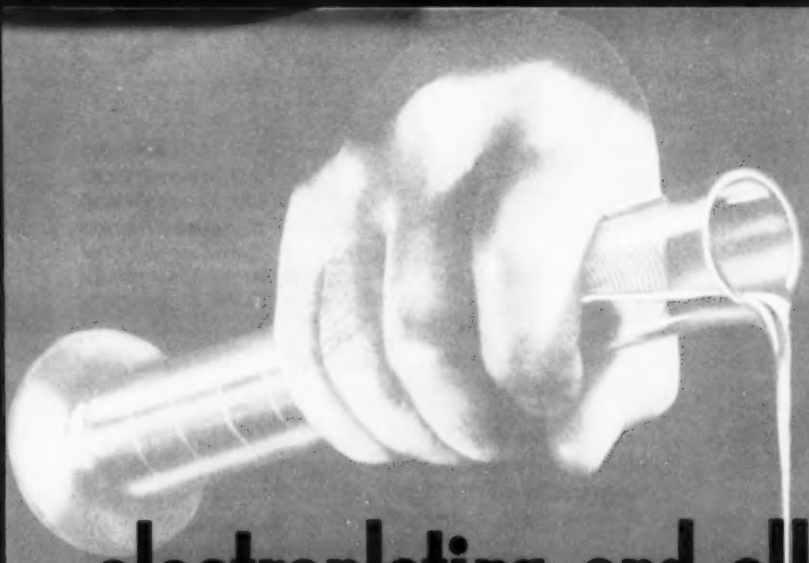
(1) Degrease (if this stage is necessary, usually an alkaline spray or soak will suffice),
(2) Rinse,
(3) Alkaline electroclean,
(4) Rinse (Note 1),
(5) Dip in acid (Note 1),
(6) Rinse (Note 1), and
(7) Plate in acid solution.

Note 1—A bright dip may be added between steps (4) and (5) and must be followed by a thorough agitated and running rinse before step (5). Usually, however, the bright dip and rinses replace steps (5) and (6). Electropolishing of copper-base alloys also may be used in place of bright dipping.

(b) Following is a typical cycle for work to be plated in an alkaline solution:

(1) Degrease (if heavy soil is present) or alkaline or emulsion clean,
(2) Rinse,
(3) Alkaline electroclean,
(4) Rinse (Note 2),
(5) Dip in cyanide (Note 2),

BULLETIN P-100



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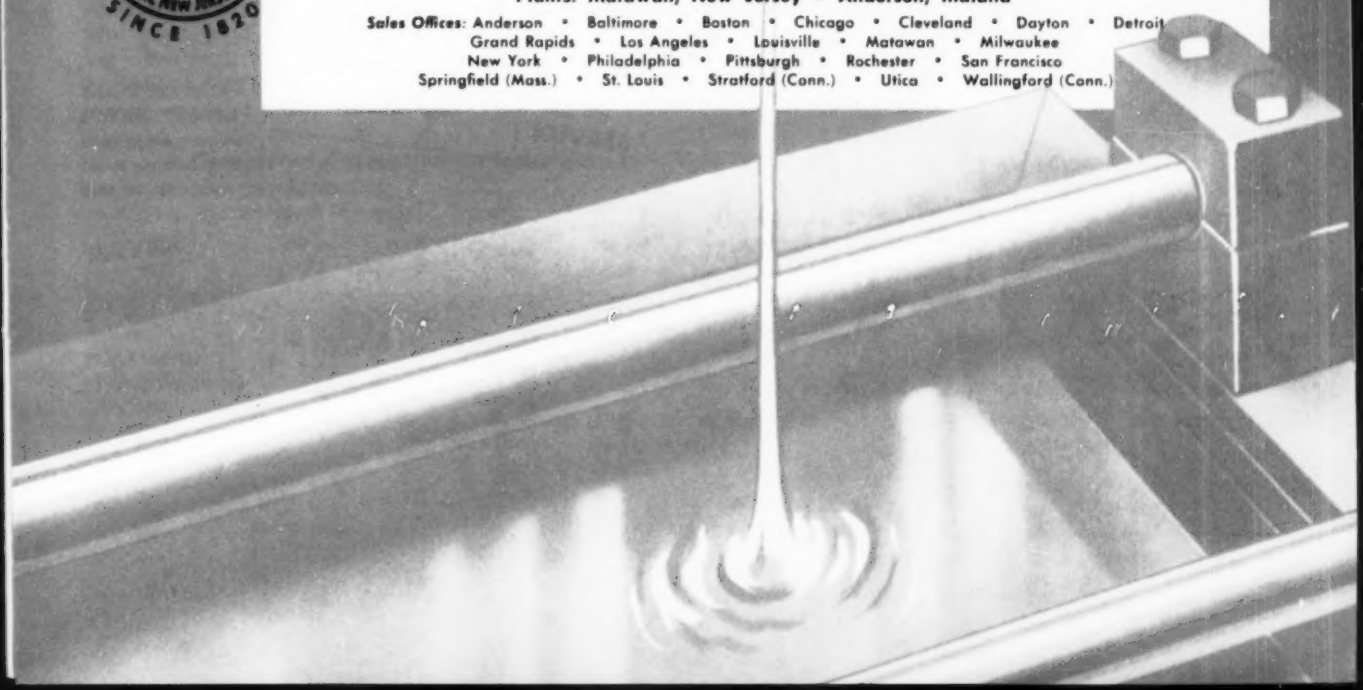

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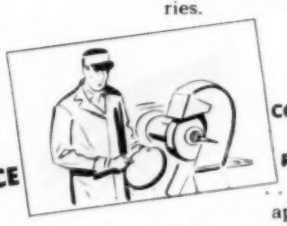

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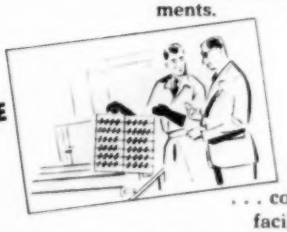

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(6) Rinse, and
(7) Plate in alkaline solution.

Note 2—A bright dip may be added between steps (4) and (5) and must be followed by two agitated and running rinses before step (5). Electropolishing of copper-base alloys also may be used in place of a bright dip.

Work To Be Barrel Plated

8. (a) Work to be barrel plated may be alkali cleaned without current by tumbling. However, if electrocleaning facilities are available, they should be used.

(b) Following is a typical cycle for barrel work to be plated in an acid solution:

(1) Vapor or solvent degrease in bulk if heavy soil is present, or alkaline soak clean.
(2) Rinse in bulk,
(3) Clean in barrel (electrolytically or by immersion and tumbling) (Note 1),
(4) Rinse (Note 1),
(5) Acid dip or bright dip (Note 1),
(6) Rinse (Note 1), and
(7) Barrel plate in acid solution.

Note 1—Steps (3) to (6), inclusive, may be done in bulk in suitable containers such as baskets if proper precautions are used to insure thorough cleaning and rinsing at each step. There is equipment so designed that the work is treated in barrels during all operations from cleaning through plating and in many cases this may be done in the plating cylinder. Step (5) may be followed by ball burnishing, in which case steps (3) to (6), inclusive, should be repeated before plating. A cyanide dip and rinse can be used to advantage between steps (4) and (5).

(c) Following is a typical cycle to be used for barrel work to be plated in an alkaline solution:

(1) Vapor or solvent degrease in bulk if heavy soil is present,
(2) Rinse in bulk,
(3) Clean in barrel (electrolytically or by immersion and tumbling) (Note 1),
(4) Rinse (Notes 1 and 2),
(5) Dip in cyanide (Notes 1 and 2),
(6) Rinse (Note 1), and
(7) Plate in alkaline solution.

Note 1—See under 8 (b) above.

Note 2—An acid dip followed by a rinse, can be used to advantage between steps (4) and (5).

Details of Preparatory Operations

Cleaning

9. The first step in the preparation cycle is cleaning. The soil to be removed determines the type and complexity of the method or methods to be used. One stage or a series of stages may be employed to do the cleaning. Following is a listing with a brief description of the various stages available:

(a) Oil and Grease Removal—Degreasing is used to remove the gross accumulation of dirt, grease, and oil and when properly performed removes most of the soil. The removal of heavy impacted buffing compound may require use of a soak in hot or cold solvent or hot solvent emulsion cleaner prior to subsequent cleaning. Oil and grease removal generally are accomplished by use of vapor degreasers (trichlorethylene or perchlorethylene); or immersion in soak tanks (work preferably agitated) containing emulsion cleaners, diphase cleaners or alkaline cleaners; and spray washing machines employing emulsion or alkali cleaners.

(b) Electrolytic Alkaline Cleaning—To produce the chemically clean surface required for electroplating, an electrolytic cleaner is used. Electrolytic cleaners are used with the work as the anode only or with the work as the cathode followed by the work as the anode. Anodic cleaning, particularly of brass, may cause slight tarnishing or etching if applied for a prolonged time (more than a few seconds) or at too high or too low a temperature. A contaminated cathodic cleaner may form a smut on the work. The voltage at the source is often 6 to 8 v. Separate solutions should be used for anodic and cathodic cleaning. Electrolytic cleaner composition is an extremely complex subject. The formula below is one of many (the chemicals are technical grade):

	Weight, per cent
Sodium carbonate (Na_2CO_3)	40 to 50
Trisodium phosphate ($Na_3PO_4.12H_2O$)	25 to 40
Sodium Hydroxide(NaOH)	10 to 25
Surface active agent (to provide a foam blanket)	1 (Approx.)
Total of individual ingredients adjusted to give 100 per cent	
This mixture is used in a solution concentration of	4 to 6 oz/gal (30 to 45 g/l)
Temperature	140° to 160° F (60° to 71° C)
Current density	10 to 30 amps/sq ft
Time	1 to 3 minutes cathodic and 5 to 10 10 seconds anodic

Note—Many people use proprietary cleaners. These cleaners are used in accordance with the suppliers' recommendations.

(c) Tumble Cleaning—A typical tumble cleaner is listed below. Proprietary cleaners are available and generally are considered preferable.

	Weight, per cent
Mild soap chips or powder	12.5
Trisodium phosphate ($Na_3PO_4.12H_2O$)	12.5
Sodium carbonate (Soda ash)	75

This mixture is used in a solution concentration of from 4 to 6 oz/gal at 180° to 200° F (82° to 93° C)

When a part is properly cleaned, it will show a continuous liquid film upon removal from rinses and acid dipping cycles.

Tarnish and Stain Removal, Neutralization

10. (a) Acid Dipping—After the work has been thoroughly cleaned and rinsed, it must be acidified to neutralize any residual alkali before it enters an acid plating bath. Thus, prior to nickel, acid copper, chromium, fluoborate and similar plating solutions, an acid dip is used. The most common dips used are 5 to 10 per cent by volume of 66° Baumé sulfuric acid, or 10 to 20 per cent by volume of 20° Baumé hydrochloric (muriatic) acid. Fluoboric acid, 5 to 10 per cent by volume of 42 to 45 per cent strength, can be used prior to fluoborate plating solutions. These dips are maintained at room temperature. The first two dips are held usually in containers that have been lined with rubber, plastic sheet or brick, or in crocks. The fluoboric acid should be contained in a rubber or plastic lined tank. A lead lined tank is satisfactory for the sulfuric acid. Leaded copper alloys, because they form insoluble salts in sulfuric or hydrochloric acid, should be pickled in fluoboric acid or nitric acid.

(b) Cyanide Dipping—After the work has been thoroughly cleaned and rinsed, it usually is put through a sodium cyanide dip prior to plating in an alkaline solution. This dip also will remove slight tarnish caused by cleaners. A concentration of from 2 to 6 oz/gal can be used at room temperature.

(c) Bright Dipping—Bright dipping usually is performed prior to the preparatory cycle but is sometimes included as a means of reactivation of the surface. However, with some jewelry plating, for example, it is an integral part of the preparation. Bright dipping is intended primarily to improve surface luster of the work. It also may be used for removal of light oxides on forgings or castings. Maximum surface luster (not mirror brightness) may be obtained by immersing the work with constant agitation for 5 to 10 seconds in one of several solutions, one of which follows:

60 to 75 per cent sulfuric acid (66° Baumé) by volume
20 to 35 per cent nitric acid (42° Baumé) by volume
5 to 10 per cent water by volume
1/8 oz per gal of hydrochloric (muriatic) acid (20° Baumé)

The bright dipped parts should be rinsed thoroughly by immersion and constant agitation in two successive cold water rinse tanks. Small irregularly shaped parts, in which acid may become entrapped, should be immersed in a warm, mild alkaline solution to neutralize the acid before immersion in cyanide. An excess of hydrochloric (muriatic) acid must be avoided; otherwise, a dull finish will result. Sometimes a small amount of lamp black is added to improve the brilliance of the work. A stoneware crock is used as a container for the acid bright dip solution. It is important that the bright dip solution be kept cool; otherwise, the work will etch instead of becoming bright. Therefore, it is desirable to have the container setting in a running cold water rinse tank. This also serves as a safety feature, in case the crock should break. It is necessary to have adequate ventilation for these dips. If the solution is inhibited with 2 to 3 oz/gal of copper sulfate, a container of AISI type 301, 302, 304, 305 or 316 stainless steel will be satisfactory.

Striking

11. (a) Copper Strike—In order to eliminate peeling, many operators copper strike before silver or nickel plating leaded copper alloys and work which has been soft soldered. A low *p*H nickel strike often may be substituted for or used in addition to the copper strike, especially before silver plating. A standard cyanide copper strike may be employed. All solder and the basis metal must be completely covered with copper. This requires up to 1 minute at 3 to 6 volts.

(b) Silver Strike—As in plating any basis metal, it is necessary to apply a silver strike to the work before it enters a silver plating solution. The power source should be on before the work is immersed in either silver strike or silver plating solution.

Appendix

Following are formulas which may be of use in preparing copper and copper-base alloys for abrasive finishing or for the preparatory cycles outlined in Sections 6 to 8 of this recommended practice.

Sulfuric Acid Pickle

A1. (a) For copper and copper-base alloys (except beryllium copper) to remove oxides, 10 to 40 per cent sulfuric acid (66° Baumé) by volume may be used. This solution is contained in a lead lined tank or tub. A crock can be used. These solutions may be used from room temperature to 130° F (82° C). Time required may be up to 10 minutes or longer.

(b) For beryllium copper to remove oxides, 60 to 70 per cent sulfuric acid (66° Baumé) by volume may be used. This solution should be contained as in Paragraph (a). It is operated at about 120° F (49° C). To simplify the removal of scale from beryllium copper, all traces of grease and fingerprints should be removed prior to heat-treatment.

"Fire Off" or Scaling Dip

A2. This dip is used for removing heavy oxide layers on small parts which can be handled in bulk. Its composition may vary depending on the purpose for which it is used. A typical example is the following:

Sulfuric acid (66° Baumé)	0 to 30 per cent by volume
Nitric acid (42° Baumé)	15 to 60 per cent by volume
Water	Remainder

This solution should be contained in a crock using the same precautions as for bright dips. The crock should be cooled by an outer water jacket and properly ventilated.

Note—Lead sulfate may form on the small globules of lead present in leaded brass, which can cause porosity and blistering of subsequent plate. Dilute nitric acid (without sulfuric acid being present) has been used successfully as has fluoboric acid.

Dichromate Pickle

A3. (a) This pickle is used to remove red color or stains remaining on the work after the sulfuric pickle described in Section A1. It is not recommended for use prior to plating as it leaves a passive surface.

Sulfuric acid (66° Baumé)	10 to 20 per cent by volume
Sodium dichromate ($Na_2Cr_2O_7.2H_2O$)	2 to 4 oz/gal
Water	Remainder

This solution should be isolated from all plating tanks to avoid contamination of solutions. It should be contained as is the sulfuric pickle, in a lead lined tank or in a crock. It should be operated at room temperature. Time required is about 1 minute.

(b) The function of the acid is to dissolve the oxide, while the dichromate oxidizes copper from the cuprous to the cupric state. Thus, if a particular brass shows a preferential dissolving of zinc, it is because there is not sufficient dichromate to oxidize the copper at the rate the zinc is being dissolved. If the scale removal is too slow, this is because there is not enough acid. Likewise, as the solution warms up in use, the time of immersion may be reduced, However, as dissolved salts build up in the bath, its activity decreases; but its use may be continued for some time by appropriate additions of acid and dichromate, bearing in mind that the function of the dichromate is to oxidize and thus speed up the removal of copper, and that the correct proportions for the particular alloy being treated and the particular results desired can be judged by the appearance of the treated metal. In general, a too-red appearance indicates not enough dichromate.

Nitric-Phosphoric Acid Pickle

A4. This pickle is used to remove oxides. The parts should be clean and dry before being placed in the solution.

Nitric acid (42° Baumé)	1 part by volume
Orthophosphoric acid (75 per cent)	3 parts by volume

This solution should be contained in a ceramic container. It should be operated at room temperature. Time required is about 1 minute.

Electropolishing

A5. Electropolishing solutions are used to impart a bright smooth finish to the work. It is accomplished by making the work anodic at 2 to 4 amps/sq in in a solution such as the following:

Orthophosphoric Acid (75 per cent)	15 to 67 per cent by volume
Sulfuric acid (66° Baumé)	15 to 67 per cent by volume
Chromic acid, flakes	2 to 10 per cent by weight
Water	9 to 15 per cent by weight

This solution should be isolated from all plating tanks.

LITERATURE CITED

[1]Graham, Pinkerton, Anderson, and Reinhard, "Plating of Pressed Metal Powder Parts," PLATING 36, 702 (July, 1949).

Metal Reflector Finishing

E. B. HEYER*

Curvature correction of reflector blank on special lathe. Irregularities in a partially processed blank (inset) may be seen in the bottom and upper right sections

FIRST surface mirrors are used in many optical instruments and generally are made of aluminized glass. In some precision applications, reflectors of metal are preferred because of their optical stability at higher temperatures and their superior resistance to thermal shock. The following story deals with the miscellaneous finishing operations that are performed by the author's company on metal reflectors for motion picture projection arc service.

Metal reflectors are made of a special soft-rolled, mill brass (0.025 mm grain size). The brass stock varies in thickness from 1/8 inch to 5/32 inch, depending on the design considerations of the final product. The first operation on the brass sheet is one where a circular blank is stamped to near optical curvature. The back of this reflector blank then is subjected to a grinding operation performed with a specially designed abrasive belt grinding wheel. The special design consists of an abrasive belt fastened to a soft rag wheel with disc cement.† Use of a soft backing, such as is provided by this method, results in a high finish, which is a necessary design feature to meet the high temperature requirements in motion picture use.

The next operation is a slight spinning on a lathe which is performed to bring the near optical curvature a little closer to the desired correction. After this spinning step, the blank is ready for curvature cutting, an operation which transforms the stamped near curvature to a true optical value. This is done with a special mechanism which generates 100 per cent curvatures on all pieces. At this point in the manufacturing, an optical test is made to check the precision of the reflector's curvature.

Grinding, the next operation, is carried out with a 400 grit aluminum oxide disc that is cemented to the face of a formed block. This grinding head is spun on the end of a motor shaft and brought up to the reflector face which is, in turn, spinning in a lathe. The formed grinding block rides in and out from center to periphery as the work spins. Again an optical test is made to insure that no distortions have been introduced by faulty grinding.

Here a "heavy" polishing operation is performed to remove the marks of the previous grinding step. The reflector is held in a jig supported by a rest. By means of leverage on this rest, a heavy even stroke of the polishing wheel over the face of the reflector is obtained. The coating compound‡ used in this operation gives an exceptionally clean cut. Oddly enough, the material is a stainless steel cutting compound that is not recommended for brass. However, it has been found to give results superior to those obtained with other materials.

---

*Heyer-Schultz, Inc., Cedar Grove, N. J.

†Distix, supplied by Abrasive Machine & Supply Co., 261 South Street, Newark, N. J.

‡Matchless Metal Polish No. 731.

§Matchless Metal Polish No. 11-D.

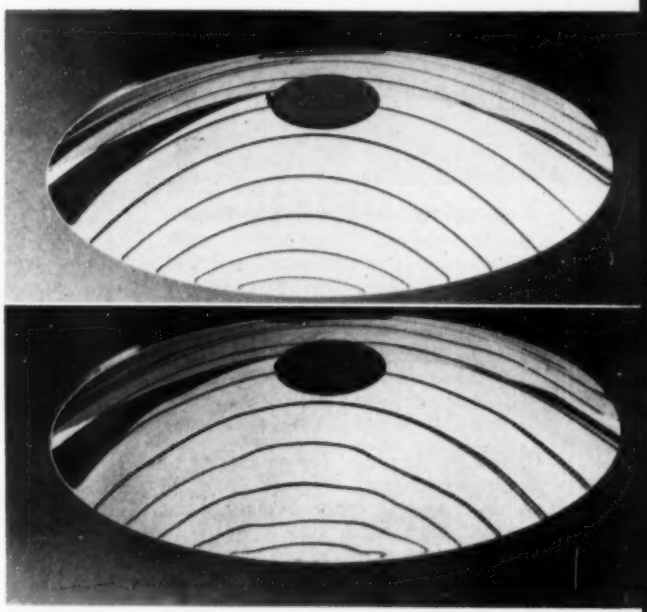
The work then is processed through the first step of the plating cycle, which consists of a single salt, room temperature, nickel bath from which a deposit of 0.0005 inch is plated. The gray or dull deposit thus obtained is colored using a lime compound.§ After cleaning in a conventional cathodic type solution, the work is rinsed, then plated in a standard sulfuric acid rhodium electrolyte. Lead anodes are used in this bath. A plating time of approximately 90 seconds produces a bright rhodium deposit of 2 mg/sq in (0.00001 inch thick). Following the plating operation, a final optical test is made and each reflector is numbered serially to complete a work card data file, a practice which has been followed over the past 20 years by the author's company.

Old reflectors that have given years of good service are returned for reconditioning and are reprocessed as detailed below. For those that are in good condition, except for surface deposits of oxides and light scratches, the only preparation required is a cleanup buffing with the stainless steel compound. After the cleanup step, they are electrocleaned and replated with nickel and rhodium, as described previously. All processing information is recorded on an individual work card. In this manner a complete case history is kept, a study of which shows the effects of variations in manufacturing operations that have occurred over the years. Through such records, it has been possible to produce consistently superior quality metal reflectors.

Another metal reflector that has developed as a result of the demands for more light by outdoor theaters, as well as by theaters showing 3D and wide-screen presentations, is the aluminized reflector. This reflector required the development of a special coating technique that would furnish an aluminized first surface mirror that would stand up under the high temperatures encountered in service. Tests of such aluminized reflectors have shown 15 per cent more screen light than rhodium plated units. The same careful procedures used to obtain optical precision in the rhodium units are carried through in the making of the aluminized product.

Units prepared in the manner described have many applications. Each of these may require variations in size and shape. Typical of these applications, in addition to that of motion picture projection, are (1) flood lighting for large outdoor areas such as airports and factory storage sections; (2) search lights, both military and nonmilitary and (3) special inspection devices. Of special interest is the last named application. A small flat reflector is used to inspect the inside of hollow propeller blades. This inspection is performed by mounting the reflector on an extension arm which is inserted into the blade. Finishing operations that may have to be performed on the inside of such blades are guided by use of this reflector. Glass mirrors were found wanting in this use because of their poor resistance to mechanical shock to which they were subjected by accidental contact during the finishing procedure.

Grinding of the reflector using a shaped rotating head

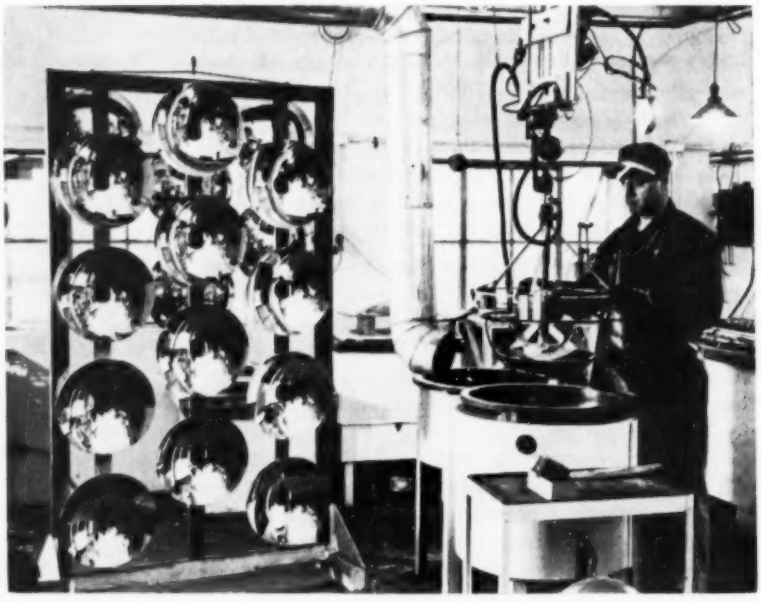


Before and after curvature correction. Optical curvature corrected in top photo, uncorrected in bottom photo

Buffing of the reflector prior to nickel plating

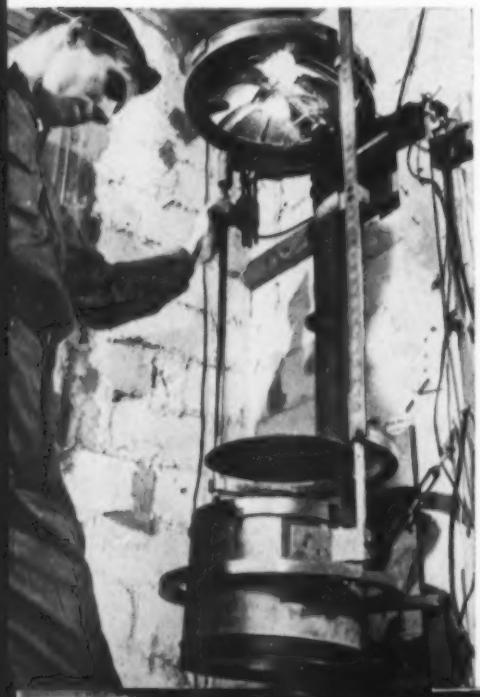
A view of the nickel plating operation

A reflector in position for the rhodium plating operation

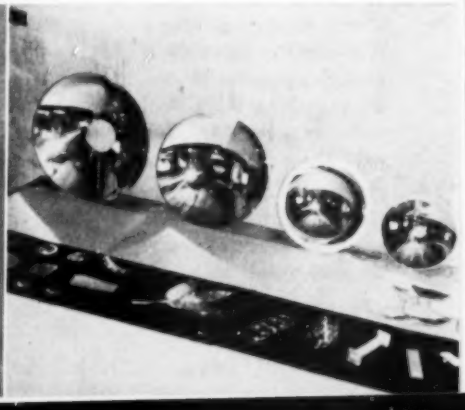


A general view of the plating area showing a rack of completed reflectors

Optical testing unit. The plated reflector, top, mirrors the light from an incandescent lamp through a variable diaphragm system to a viewing screen at the bottom. Optical imperfections in the reflector are easily detected by the operator in the form of shadow patterns



Photos showing a variety of reflector shapes which are rhodium plated or aluminized



CLEANING AND PREPARATION OF METALS FOR ELECTROPLATING

VIII. EFFECT OF OXIDE FILMS. A SURVEY OF THE LITERATURE

(Continued from March, 1954 issue)

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Acknowledgment is due the Research Committee, Dr. D. Price, Oakite Products, Inc., Chairman; The Research Directing Subcommittee, Mr. Walter L. Pinner, Houdaille-Hershey Corp., and Clarence H. Sample, The International Nickel Co., Chairman and Vice-Chairman, respectively; and the Project Committee, Mr. E. T. Candee, Lea Manufacturing Company, Chairman; Dr. Edward Parker, Technic, Inc., and Dr. E. B. Saubestre, Sylvania Electric Products, Inc., for their contributions to this project.

*AUTHORS

B. *Effect of Oxide Film on the Electroplate*

Now that the mechanisms by which electroplating occurs onto oxide-soiled cathodes have been discussed, it is necessary to consider the effect that such a soiled cathode has on the final product, the electroplate. Here some quantitative data are available from the literature.

In general, the oxide film affects two properties of the electroplate, the adhesion and the microstructure. These will be considered separately.

Adhesion

The literature indicates no doubt that an oxide film on the cathode will interfere in some way with the adhesion of the electroplate. Just how this interference occurs, and how much it amounts to, has, however, not been conclusively determined.

Meyer[73] remarked that the interatomic forces causing adhesion fall off very rapidly with distance, and vary inversely as the fourth power of the interatomic distance. Thus, the forces of adhesion and cohesion between atoms become insignificant at distances greater than 50 Å. Therefore, traces of oxide or grease will cause nonadhesion. However, he did not mean to imply that adherent coatings cannot be deposited on an oxide film, but only that the force of adhesion will be high only where the oxide is less than 50 Å thick. Smith and Karle[99] agreed that the adhesion depends on the thickness of the intersurface film. However, they believed that the force of adhesion between the plate and the basis metal decreased as the square of the interatomic distance. They also remarked that the thickness of this interfacial film is the primary determinant of the adhesion of the deposit, and that the composition of the separating film is only of secondary importance. No evidence was offered to substantiate this.

Ferguson[24] also believed that the adhesive force decreased very rapidly with distance. Thus, a layer of impurity only one or two molecules thick will reduce almost to zero the attraction of the basis metal atoms for the atoms of the plate. Such a film will be invisible, and may be oxide, sulfide, etc. Dubpernell[17] believed that anything on the surface of the basis metal which will separate it from the plate will cause nonadhesion. Lyons[65] stated that anything which physically interferes by increasing the distance over which the bond energies must operate, or which interferes chemically by occupying some of these bond energies, will interfere with the adhesion of the electrodeposit.

Hothersall[48] listed the principal causes of poor adhesion as follows:

(a) Surface layer of the basis metal is initially weak or is embrittled by codeposited hydrogen.

(b) The presence on a metal surface, at the start of deposition, of a film of oxide, grease, adsorbed colloidal matter, pickle smut, etc.

(c) A layer of defective deposit formed in the early stages of deposition.

Lyons[65] described the various steps in the interfering process. As the film forms on a wet surface (freshly cleaned and pickled steel), first it is invisible and doesn't interfere with adhesion. Then it thickens enough to become visible, and at some point begins to interfere with adhesion, probably being partly displaced and partly penetrated. As the oxide dries, it becomes less subject to penetration, but causes peeling of the plate. Finally it becomes insulating and no plate is formed. Blue oxide usually prevents deposition, while invisible oxides may prevent or promote adhesion depending on the structure, thickness, and chemical nature of the oxide.[48,65]

Hothersall, in discussing a paper by Bengston,[3] remarked that if the oxide film is still present underneath after plating on aluminum by the Travers process, then good adhesion could be obtained only as follows: Since the film is nonconducting, the plate must extend tentacles through the oxide film. The adhesion would be a measure of the force required to break these tentacles. Since these tentacles cannot occupy the whole cross section, low adhesion would be expected. Bengston agreed that stringers of the metal through the oxide probably do explain the adhesion, but he noted that metal deposition is considered to occur within the oxide coating itself, and this might improve adhesion.

Dubpernell[17] noted that poor adhesion may be caused by films left from alkaline cleaning, by a chromate dip and by passive layers in general. Liger[60] believed that the adhesion of a plate which covers an oxide film is precarious and is a function of the adhesion of the oxide. He considered it essential for good adhesion that the surface be free of invisible oxides, and be in an active condition. This view was shared by other writers[46,71,72,101,118].

Jacquet[53] showed that hydrophilic colloids (proteins, etc.), when adsorbed at the cathode, would cause poor or no adhesion, while other colloids had no effect. Colloids which affected adhesion did so only when present in an amount greater than a certain critical concentration.

Marie and Thon,[67] in work previously described (see above) on the mechanism of plating onto cathodes coated with insulating layers 50 and 300 Å thick, also discussed the adhesion mechanism in such cases. They believed that the decreased adhesion resulting from plating onto insulated cathodes could be attributed to the fact that the points of contact between the deposit and the basis metal are relatively few. These points of contact, occurring at the base of channels and interstices in the film, correspond to places of initial nuclei formation. On clean cathodes these contacts are infinitely more numerous, forming a nearly continuous bond to the support. Adhesion is then a function of the fraction of the cathode surface where there is immediate contact between the deposit and the basis metal. Where this fraction is a maximum, the deposit crystals directly continue the cathode structure, and adhesion is at a maximum. As the insulating layer thickens, the points of contact become fewer in number and the adhesion decreases. Hothersall[48] believed that a similar mechanism explains the adhesion of deposits plated over oxide films.

Hothersall[45,50] cleaned and pickled steel specimens and then allowed them to form air films at 25° and 100° C. They were then introduced dry into a plating bath and nickel plated. Strongly adherent deposits were obtained in all cases. No explanation was given for this apparently anomalous behavior. Whether the oxides formed were too thin, too porous or sufficiently adherent themselves so as not to cause poor adhesion, or whether they were removed by action of the plating bath, cannot be ascertained from the meager data given.

Logozzo[62] produced a heavy oxidation on steel by a chromic acid reverse etch prior to plating. He believed that a chromic acid film had been formed, but this had no ill effects on the adhesion of the chromium deposit. Lewis[58] noted that anodizing of steel in chromic acid electrolytes prior to chromium plating is definitely a passivating treatment, but nevertheless permits good adhesion. He attributed this to reduction of the oxide during the plating operation.

In another paper, Lewis[59] used various anodic and cathodic cleaning treatments, with and without a subsequent acid dip, and determined their effect on the adhesion of the electroplate. In general, he found that cathodic cleaning produces a film which interferes with adhesion unless removed by an acid dip. Anodic cleaning may or may not interfere with adhesion. Roehl[86] used the modified Ollard test[22] to evaluate the effect of various cleaning treatments on the adhesion of electrodeposits. He found that if the black film left on the surface during the first stage of anodic cleaning was removed, adhesion would be good. If it was not removed, the deposits would not adhere to the steel.

Interrupted plating is usually considered bad practice. Schneidewind and Urban[96] reported the results of interrupted or intermittent plating in chromium plating operations. In all cases, this type of operation resulted in a badly cracked, peeling deposit. They believed that when the current was interrupted the chromium probably became passive, and this caused peeling of the deposit. Piersol,[80] however, stated that although intermittent plating is always considered to cause poorly adherent deposits, he used such a method to obtain thick, adherent laminated chromium deposits.

Müller and Stein[83] found that films were formed by dipping silver, copper, and brass, and cathodically treating gold and platinum in chromate solutions. These films effectively prevented the adhesion of a silver deposit subsequently plated onto the filmed specimen. Also, having formed films on gold and platinum foils by cathodic treatment in chromic acid solution they then proceeded to treat these films with various acids, varying the acid, its concentration, temperature, and time of treatment. After acid treatment, the foils were silver plated. If the deposit was nonadherent, then the acid treatment could be said to have had no effect on the chromate film, and vice versa.

Halla and Tompa[42] in studying stainless steel as a cathode material found that iron deposited on the stainless adhered strongly where the protective oxide had been damaged and the basis metal laid bare. The deposit was easily separated in a continuous layer from the other places. On a given stainless specimen, the adhesion of the deposit, on repeated electrolysis, always occurred at the same places. However, after lying for more than one week in air, the oxide film healed up and detachable deposits were obtained. Plating onto freshly cleaned stainless produced extremely porous deposits. Allowing the stainless to remain in air caused the oxide film to heal, and led again to a pore-free deposit. Also, subjecting a stainless cathode to the action of the hydrochloric acid fumes from the iron plating bath caused sufficient removal of the oxide to produce an adherent deposit.

Mathers and Gilbertson[65] found in preparing steel for thick silver deposits that freshly cleaned cathodes, exposed to air for even a short time before striking, were covered by an oxide film which caused poor adhesion. In all cases it was necessary not to expose the cathode surface to air after the acid dip. Prior to plating, the cathode should be kept wet. However, after several hours in water, an oxide film will re-form and cause poor adhesion. If formaldehyde was added to the water the cathode could be kept in the water for several hours without affecting the adhesion.

Hothersall[49] made extensive adhesion tests to determine the adhesion of nickel to brass under various circumstances of surface preparation. When polished brass was cleaned in boiling metal cleaner and then rinsed in boiling water and allowed to dry in air, an oxide formed which caused the surface to darken slightly. This oxidized specimen was then degreased and cathodically cleaned in an alkaline solution for 2 minutes at 50 amps/sq ft and then thoroughly rinsed. It was then nickel plated and the nickel deposit was found to be entirely nonadherent. A similarly prepared specimen, omitting the oxidizing treatment in boiling solution, accepted a moderately adherent plate.

Tucker and Flint[104] studied the effect of various surface treatments in cleaning and preparing metals for chromium plating. In a study of the rate of surface deterioration of nickel-flashed copper surfaces, they determined the variation in ability to accept chromium plate. Their criterion of surface deterioration was the decrease in the bright chromium range as shown on a Hull cell cathode. It was found that immersion of the nickel surface, after cleaning, into cold water for one to ten minutes, caused substantial deterioration after one minute. This apparently was an indication of the rate of formation of oxide films which interfere with the surface. Likewise, buffed electrolytic nickel showed less sensitivity to deterioration than the nickel flash de-

scribed above. Here also after one minute the bright plating range was considerably reduced. With buffed cold-rolled steel, deterioration occurred between twenty seconds and one minute after pickling.

In discussing this paper, Lyons stated that the surface preparation requirements are similar for chromium plating baths as for other baths. However, chromium plating baths are probably more sensitive to surface films on the cathode, since unsuitable cathode surface films modify the type and structure of the deposit profoundly, whereas with other metals the effect is usually on adhesion.

Candee[14] studied various pickling operations prior to electrogalvanizing of steel. He tested his specimens for the presence of oxide films by means of a copper replacement test. A drop of 0.05 M copper nitrate solution was allowed to remain on the metal for one minute. Where a bright copper deposit was formed this was taken as an indication that no oxide film was present. A dark brown copper deposit indicated a discontinuous oxide film, while no deposit indicated a continuous oxide film. Samples were tested at intervals from two seconds to fifteen minutes after pickling in order to detect the presence of films on the metal and to determine the rapidity of film repair. These tests were then correlated with the adhesion of zinc plated onto similar specimens. It was found that any specimen which produced a bright or brown deposit in the copper test would accept a strongly adherent plate. However, when no copper deposit was formed the zinc plate adhered poorly.

Hothersall[49] conducted quantitative adhesion tests to determine the effect of oxide films on the adhesion of nickel to nickel. Using a copper plating technique (see above) to evaluate the presence of oxide films, he tested various pickling treatments for their effectiveness in removing oxide films. He then carried out experiments to determine which of several methods produced oxide films, and which methods had no effect on defilmed nickel. He found that, apart from air-formed films, films may be produced in the preparation of nickel surfaces by:

(a) Anodic treatment which makes nickel passive
(b) Dipping nickel into solutions containing oxidizing agents
(c) Dipping nickel into tap water for prolonged times

Then using these various film-forming methods, he plated over the filmed nickel and made adhesion tests. The results are shown in Table I. The results show that where an oxide film was present (as indicated by the copper plating technique) poor adhesion was obtained. Where the copper test indicated no oxide film, or where the oxide film had been removed, good adhesion was obtained. It would seem that these data suffer from several difficulties. The copper plating test gives no indication of the thickness of the oxide film itself. The only thickness criterion is that the film must noticeably interfere with copper deposition. One might, therefore, expect such a film to be of sufficient magnitude to affect adversely the adhesion of a nickel plate. In this sense, therefore, Hothersall has really prejudged his results, by the adoption of a plating criterion to characterize his oxide films. Nevertheless, this remains at least one of the rare quantitative studies performed on this subject.

Gardam[32] studied plating onto stainless steel by various techniques. If no special technique was used, the adhesion was usually negligible. If chromium specimens were etched in sulfuric acid solution, transferred to an acid copper bath and plated, a dark, patchy, nonadherent copper deposit was found. The adhesion of chromium to nickel-plated brass was tested after various treatments of the nickel surface. The results are shown in Table II. The results show that the chromium and the nickel basis metals are less tolerant of oxide films than steel. On nickel, mechanical removal of oxide produces good adhesion. Visible oxide causes poor adhesion. On steel, even oxidation by chromic acid does not noticeably affect adhesion, while with chromium such immersion causes poor adhesion. With chromium, the oxide forms so readily that immersion in distilled water is sufficient to interfere with adhesion to some degree. These data conflict to some extent with those of Tucker and Flint, but because of the differences in systems, methods of evaluation and criteria of surface deterioration, the two sets of data are not strictly comparable.

TABLE I. THE EFFECT OF FILMS ON THE ADHESION OF ELECTRODEPOSITED NICKEL TO NICKEL

Treatment*	Adhesion	
1. None	Very strong	No separation possible
2. Dip in tap water, 90 sec§	Very strong	No separation possible
3. Dip in plating solution, 90 sec§	Very strong	No separation possible
4. Dip in 1:1 HNO_3, 30° C, 10 min‡	Very strong	No separation possible
5. Anodic Treatment 30 per cent H_2SO_4, 150 amp/sq ft, 30° C, Nickel Passive†	slight	easily separated
6. Dip in 30 per cent H_2SO_4 with 150 g/l $Fe_2(SO_4)_3$, 30° C, 15 sec†	slight	easily separated

*Specimens first cleaned and treated to remove oxide films
†Treatment previously found to produce oxide films
‡Treatment previously found to remove oxide films
§Treatment previously found to have no effect

TABLE II. QUALITATIVE TESTS OF ADHESION OF CHROMIUM TO VARIOUS METALS

Treatment	Adhesion
1. Adhesion of Chromium to Nickel-Plated Brass:	
Wiping with a soft cloth	good
Cathodic cleaning in commercial alkaline cleaner	fair to poor
Cathodic cleaning with pure alkaline cleaner	fair to good
Wiping with cloth after 24 hours in dry air	good
24 hours in lab air (specimen visibly fogged)	poor
2. Adhesion of Chromium to Steel:	
Wiping the steel	good
Anodic etch of steel in copper plating bath, 48° C, 200 amp/sq ft, followed by currentless immersion in the chromium bath for 1, 2, 4, and 16 hours	good
3. Adhesion of Chromium to Chromium	
Immerse in chromium plating solution, 6 min	nil to poor
Immerse in distilled water, 60° C, 5 min	fair
Immerse in distilled water, 75° C, 5 min	fair

Microstructure

In a previous section above it has been noted that under certain circumstances the microstructure of the deposit may be determined by that of the basis metal. In many cases, there is ample evidence that the crystals of the depositing metal will continue the crystal structure of the basis metal. In some cases, this continuation will be so perfect that it will be impossible to tell where the basis metal ends and the deposit begins. This phenomenon of crystal continuation has been interpreted to indicate that perfect adhesion has been attained.[32]

What, however, will be the effect of thin oxide films on crystal continuity of the deposit? Most authors are quite specific on this subject. Thus, Portevin and Cymboliste[91] believed that the interposition of foreign matter between the cathode and the deposit will prevent crystal continuity. Blum and Rawdon[7] found that crystal continuation would occur if the copper cathode had been given a nitric acid dip, but if this dip were omitted crystal continuation would not occur. Blum[6] found that crystal continuation would occur only on a properly cleaned copper surface. Liger[66] stated that if a copper cathode is covered with a film, even extremely thin, of any sort, then crystal continuity would not occur. Finch and Williams[27] found that interrupting the current or removing the specimen, washing, drying, and then replating, would in all cases destroy crystal continuity of nickel on nickel. Further, they noticed that in these cases the two nickel layers were only weakly adherent. This, they noted, agrees with the belief that at least in the first few atomic layers of electrodeposit crystal continuation is the prime requisite of good adhesion. Wood[114] found that crystal continuation would occur only on cleaned oriented cathodes. When the cathodes had not been cleaned, crystal continuation was never observed.

However, it must be noted that crystal continuation per se can serve only as an indication that the basis metal was free of impurity at the instant of deposition. The bath itself could conceivably have removed any films of impurities present on the metal entering the plating bath. Hence, crystal continuation cannot be taken as a criterion of surface cleanliness unless it is definitely known that the plating bath has no solvent or other cleaning action on the surface films.

However, some authors believed that crystal continuation may occur in the presence of thin films on the cathode surface. While Jacquet[54] found that thin films of hydrophilic colloids will normally interrupt crystal continuity, with electrolytic copper substrates this is not so. Thus, with electrolytic copper, successive deposits of copper separated by thin adsorbed films of colloids exhibited continuity. However, if between successive deposits conditions were changed which would change either the rate of nucleation or growth, then continuity will be interrupted. It appears in this case that, although apparently continuation was occurring across layers of adsorbed colloids, actually the conditions of electrolysis were such that these conditions and not the basis metal structure itself were influencing the deposit structure. Thus "continuation" was observed if electrolysis conditions were unchanged. If, however, these external conditions were altered between successive deposits, then "continuation" did not occur. This would indicate that the "continuation" observed through the adsorbed layers was fortuitous and caused not by basis metal influence operating through the colloid film, but rather caused by external conditions of electrolysis. Hence, this work probably cannot be taken as a definite contradiction of the previous statement that thin films will prevent crystal continuation.

Marie and Thon[67] (see above) also determined the effect of thin insulating layers on the microstructure of the deposit. They found that the microstructure of metal plated onto these insulating films always consisted of large crystals, starting right from the interface. When no insulating layer was present the deposit consisted of small crystals near the interface, and larger crystals appearing only at a certain distance away.

At the film, the deposit formed only at certain preferred points (channels, interstices, etc.). Thus, the probability of nucleus formation is low, while the growth influences are large. Thus, from these few nuclei large crystals grow right from the beginning. However, on the nonfilmed surface, where the entire surface is accessible at the start, nuclei formation can start in many more places, resulting in the formation of a multitude of small crystals.

Summary

A. Since a "perfectly clean" surface is rarely attained, the plater usually tries to substitute for an objectionable film one which will not interfere with the plating operation.

B. Oxide films form rapidly on clean metals. Both electronic and cationic conductivity are necessary for film growth. The more imperfect the oxide lattice the greater the opportunity of rapid growth.

C. The structure of electrodeposits is controlled by the relative rates of crystal nucleation and growth. These are governed by external factors and by the nature of the substrate surfaces. Where the respective lattice parameters differ by less than 15 per cent, crystal continuation can occur. Deposit growth is characterized by three stages. In the initial stage, substrate influence is paramount. In the final stage, the external conditions of deposition are determinative. A transition stage joins the initial and final stages.

D. Adhesion of electrodeposits depends on the same interatomic forces which cause cohesion, physical adsorption, etc. The best possible adhesion is obtained when crystal continuation occurs.

E. How a metal may deposit on an oxide-coated specimen depends on the properties of the oxide and of the plating bath. Deposition may occur on top of, in the pores of, or be prevented by the oxide, depending on the conductivity of the oxide. The plating bath may dissolve or reduce the oxide during the plating operation. Little quantitative data are available to substantiate any of these mechanisms.

F. Oxide films may prevent or promote adhesion. The meager data available do not correlate adhesion with any property of the oxide itself. Only with organic films are there such data.

G. Oxide films are believed to prevent crystal continuity. Here again there are no quantitative data.

Summary of Proposed Experimental Method

A clean metal specimen will be soiled with a weighed amount of oxide, plated with a second metal, and then reweighed. All weighing operations will be carried out on a microchemical balance with a sensitivity of the order of one microgram (1 μg), and operating in an inert atmosphere. Cleaning operations will be carried out in vacuum apparatus, cleaning being accomplished by the admission of hydrogen, and soiling by the admission of oxygen into this apparatus.

By means of these weight determinations, coupled with suitable microcoulometric and microanalytical measurements, it should be possible to elucidate the mechanism of plating on oxide-coated cathodes.

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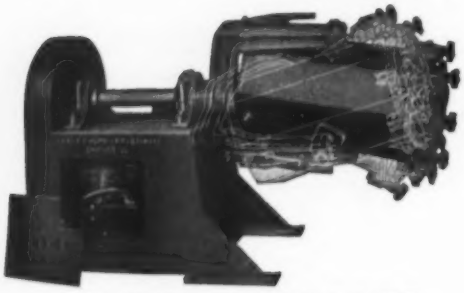

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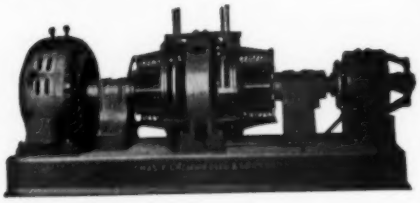

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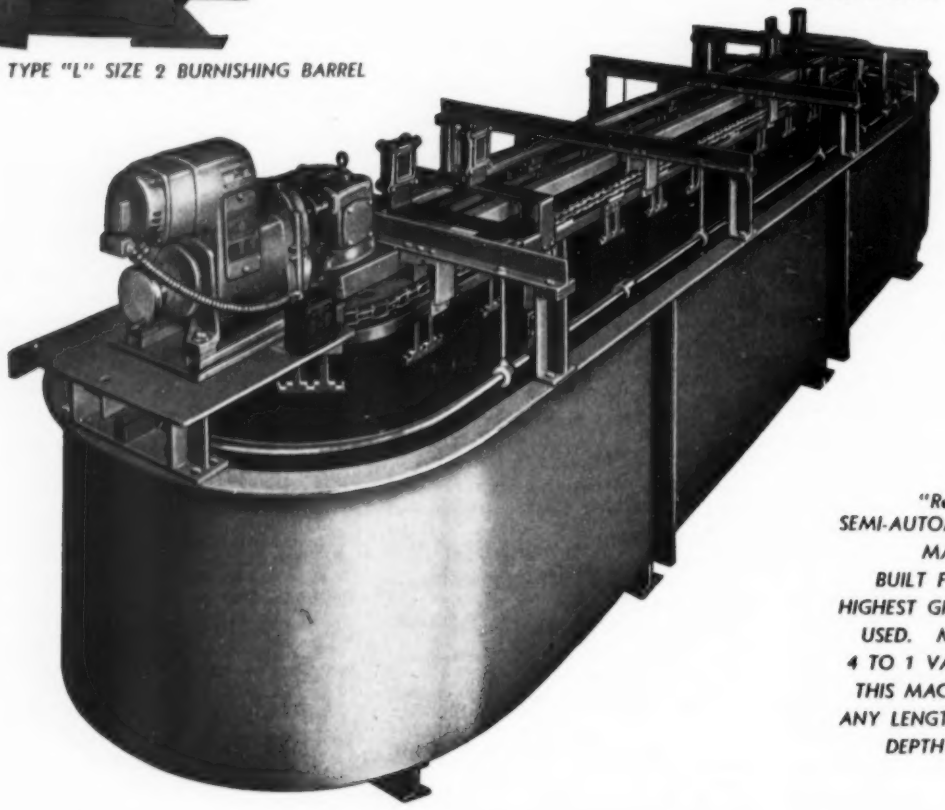

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July 12-15, 1954

The committee for the AES Convention to be held at the Statler Hotel in New York City, July 12–15, has made arrangements to coordinate travel for members and others planning to attend the convention. Irving Goldwasser, a member of the committee, has secured the assistance of the Atlantic-Pacific Travel Agency, Inc., 138 E. 53rd St., New York, N. Y., to make travel accommodations for those conventioneers who make requests. Mr. Jules Cortell, president of the agency, suggested that anyone wishing to take advantage of this offer, which is free of any service charge, should contact him at the above address. Where enough registrations from one city or territory would make it feasible, a special plane or railroad car could be obtained for conventioneers only.

The entire committee is rolling along in high gear, especially the educational section headed by Milton Nadel. Milton has delivered many papers before various branches of the AES and is librarian of the New York Branch. This background gives him an excellent idea of the subjects, quality and value of papers to be offered at educational sessions, which are the most important events of any convention sponsored by a technical society.

Bruno

Goldwasser

Papers on leveling in copper baths, electropolishing, organic finishing, polishing techniques, electroless plating, waste disposal, water treatment and other topics of interest to the finisher will be presented.

Leveling studies in acid copper and in cyanide copper plating solutions are covered in two papers submitted by Barnet D. Ostrow and Fred I. Nobel. Results of numerous tests performed with a Brush surface analyzer are presented.

A. S. Kohler's paper, "Some Considerations of Importance in Ball Burnishing," is an up-to-the-minute explanation of some of the underlying principles involved. It is done in such a manner as to enable operators to apply the ideas to their own problems in a methodical rather than a hit-or-miss manner.

"A New Instrument for Measuring Stress in Electrodeposits" is to be presented by Joseph B. Kushner. The author describes an accurate, simple and rapid apparatus which has very definite advantages over present stress measuring units. The instrument is self-contained, simple and rugged. It can be used for control purposes right in the plating tank or for research work with its own tank.

W. J. Pierce and W. L. Pinner will describe a new accelerated corrosion test for electrodeposited metallic coatings in their paper, "An Electrochemical Corrosion Test for Electrodeposited Metallic Coatings." The test, which is electrochemical in nature, has been shown to predict closely the service behavior of plated coatings.

A new process for plating copper tin alloys that give leveling-type plates that smoothen rough basis metal surfaces as much as 66 per cent per 0.001 inch of plate will be detailed by W. H. Safranek and C. L. Faust in their paper, "Copper Tin Alloy Plating."

"A Practical Application of Electroless Nickel Plating" by John D. MacLean and Seymour Karten is a paper that deals with a practical application of a modified citrate-ammonia electroless nickel deposit on steel bomb fuse components. A description of the complete physical layout of a production department developed for this process is given.

Dr. F. A. Lowenheim's paper, "Throwing Power of Tin and Tin Alloy Plating Solutions," presents a short review of the theoretical basis of throwing power. This property of stannate tin plating solutions is known to be excellent but there are few published figures. Some experimental data are given to show how throwing power as measured in the laboratory is affected by variations in plating conditions.

Space limitations prevent the publication at this time of summaries of the other papers on the technical program. These will be covered next month.

The committee has arranged to publish a convention journal which is being prepared by cochairmen Derick Hartshorn, Jr., and Peter L. Veit. This journal will be distributed at the convention and will contain the Official Program, a very interesting technical article, a list of New York Branch members, and advertisements of manufacturers and suppliers of equipment and supplies for the finishing industry. Proceeds from the journal will be used to help defray the cost of one of the functions planned for the convention. The cochairmen wish to announce that there is still time for those wishing to insert an advertisement, but urge them to do so at an early date, as the closing date is fast approaching.

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Book Review

DR. HAROLD J. READ
Professor of Metallurgy, The Pennsylvania State University

ELEMENTS OF HEAT TREATMENT by George M. Enos and William E. Fontaine, 1953, 286 pages. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. Price, $5.00.

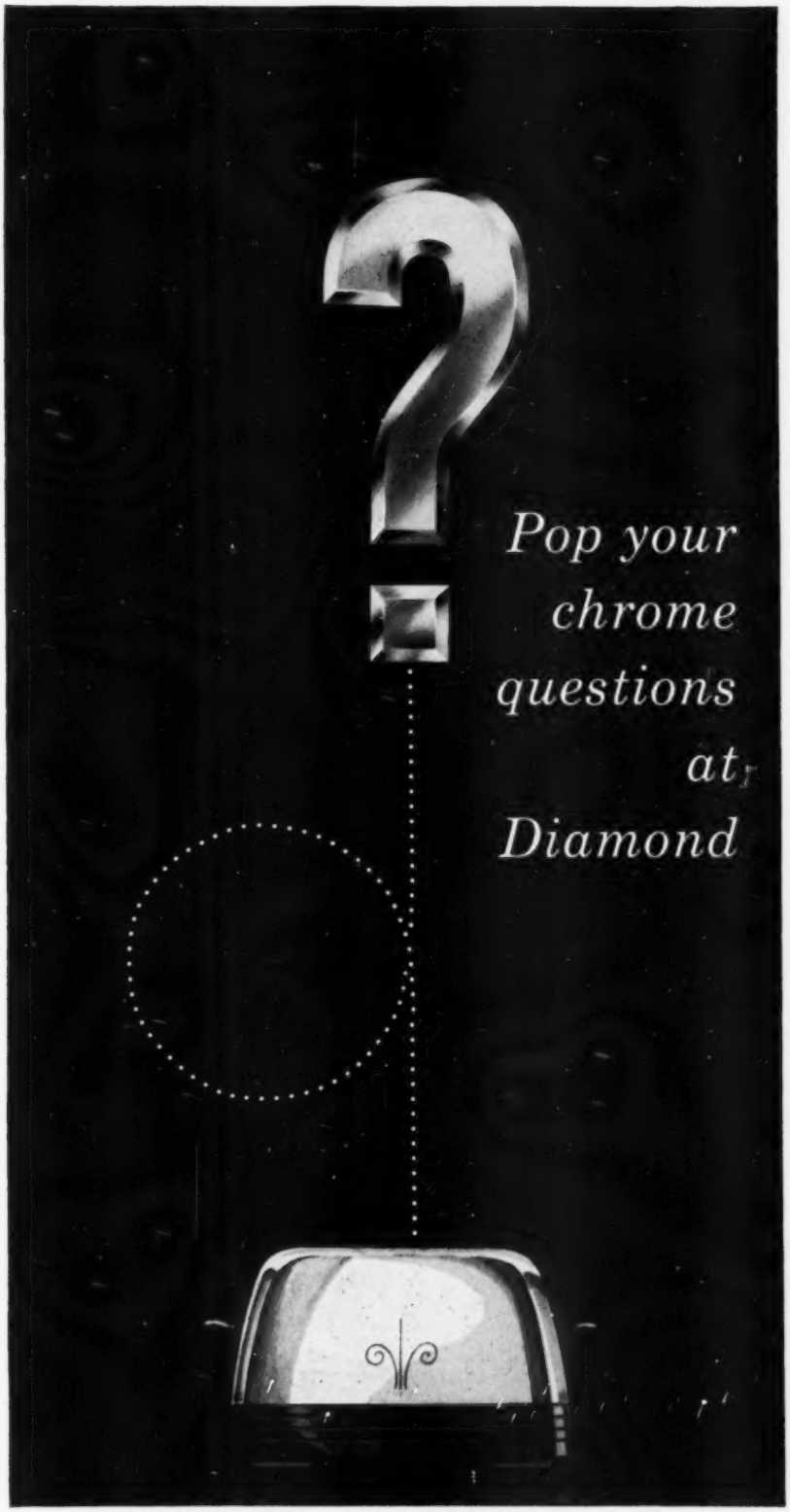
Although the ordinary, day-to-day work of the metal finisher may not require a knowledge of metallurgical heat-treating theory and practice, there are many reasons why such knowledge may, on occasion, prove to be most valuable. Metals are extensively used in the construction of his equipment, which can be more intelligently used, maintained and repaired if the user understands the heat-treatments to which the metals may have been subjected. More directly, there are some metal finishing operations which may destroy the effects of heat-treatment and alter properties, such as tensile strength or ductility, of the workpieces being processed. A finisher might, for example, bake enamel on an aluminum alloy at a temperature which would overage the alloy, thereby negating the careful heat-treatment to which it had been subjected.

The important question to be answered here, however, is whether the book under consideration is suitable as a source of pertinent information for the metal finisher. It is said in the preface that the text is "an attempt to set down in simple straightforward language the basic fundamental theory involved in the heat-treatment of metals." Either the authors have confused "fundamental" with "elementary," or they have no idea of the progress which has been made in the fundamental theories of heat-treatments. As a presentation of superficial theory and practical explanations of the why and how of heat-treating, the book has but very limited merit.

It covers the field adequately, it is sufficiently accurate and it is replete with illustrations. In spite of this the book is disappointing. To be blunt, it is downright dull and difficult to read. The style is labored, the sentence construction loose and often illogical. Some of the passages having to do with hardenability and with treatments for alloy steels will be very hard sledding for the reader whose metallurgical background comes entirely from what he has read in the book up to these passages.

Even some of the illustrations are so cluttered (Fig. 8.5, for example) with notes and other attempts to put too much in one picture that they must be more puzzling than informative to the metallurgical neophyte. Many of them hardly seem appropriate to the intended elementary nature of the text.

Inasmuch as there are much better books in this subject field, at least so far as the metal finisher's needs are concerned, it cannot be recommended.



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Blistering of Copper-Plated Zinc Die Castings. W. Briese, Metalloberfläche **5B**, 189 (Dec. 1953).

Hemispherical blisters were found to be due to inclusion of traces of trichlorethylene or especially perchlorethylene in the pores of the castings. Heating of the solvent-degreased parts in an oven at 160° C (320° F) for 15 to 20 minutes or immersion in a boiling trisodium phosphate solution for 5 minutes before electrolytic cleaning eliminated blistering.—Otto Kardos.

Corrosion of Lead. W. Katz, Metalloberfläche **7A**, 161 (Nov. 1953).

Corrosion data for lead and lead-antimony alloy in solutions of sodium chloride, sodium sulfate, sulfuric acid, sodium fluoride and bifluoride, fluosilicic acid, ammonium acetate, sodium carbonate and bicarbonate, sodium-, calcium- and barium hydroxide are given.—Otto Kardos.

Polarographic Determination of Electroplating Addition Agents. J. Smelik, Metalloberfläche **5B**, 166 (Nov. 1953).

The concentration of some electroplating addition agents can be determined by the depression of the height of polarographic maxima. Standard solutions of copper chloride and sulfuric acid or cadmium cyanide in excess sodium cyanide are used to which is added 1 ml of the acid or cyanide plating solution, respectively. As the height of the maximum does not decrease linearly with increasing concentration of addition agent standardization curves have to be made. Data for naphthalene disulfonic acid in nickel baths, a commercial cadmium and a commercial nickel bright-

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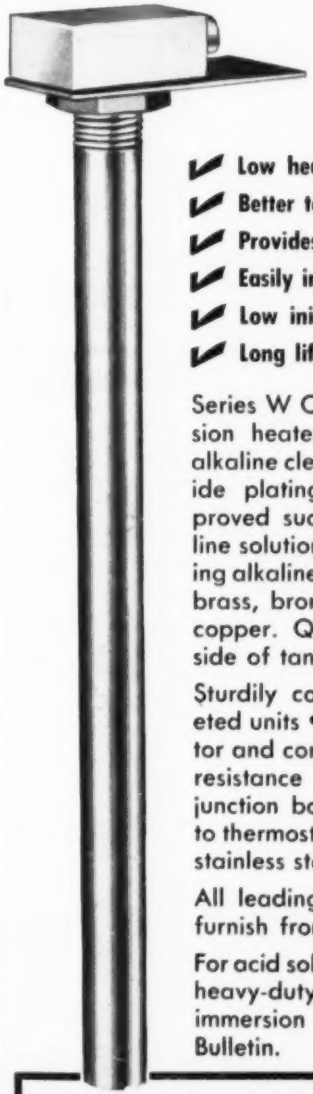

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Article Abstracts

ener, are presented. Wetting agents also depress the height of polarographic maxima which must be considered.—Otto Kardos.

D-Chromium Plating. Arthur Kutzelnigg, Metalloberfläche **5B,** 156 (Oct. 1953).

The author discusses what he calls a third type of chromium solution (bright, decorative and hard chromium being the other two) as being "tetrachromate" bath ($1Na_2O$:4–6 CrO_3). The characteristics of this bath are as follows: low temperature operation (20° C, 68° F), a current density of 50 amp/sq dm, a current efficiency of 37 per cent, better throwing power than the usual decorative chromium plating baths. The deposit is gray matte and low in porosity, is easily buffed and may be formed after plating. Direct chromium plating of brass castings and stampings, copper over steel and zinc, steel, zinc and aluminum are discussed. Five figures and 12 interesting photographs of chromium deposits using electron microscope technique (3000 and 8000x) are included.—D. G. Foulke and O. Kardos.

Progress in the Field of Phoaphating. H. Keller, Metalloberflache **7A,** 129 (Sept., 1953).

The uses and history of phosphate coatings are briefly reviewed. Curves are presented showing (1) the change of potential (0.15 to 0.2 volts in the more noble direction) after 4–12 minutes' phosphating and (2) of the decrease in porosity with phosphating time. Porosity and surface roughness permit adsorption of oils, waxes, etc., and make for good paint adhesion especially on edges (surface profiles are given). For bending, the coating must be thin. Phosphate coatings are used for corrosion protection, friction reduction in cold forming operations, and insulation (3–15 μ coating reach a breakdown voltage in the range of 15–150 volts). Phosphating of zinc and aluminum and their alloys are discussed briefly along with assemblies of dissimilar metals. Stainless steel generally cannot be phosphated, but oxalate treatments have been used before cold forming.—Otto Kardos.

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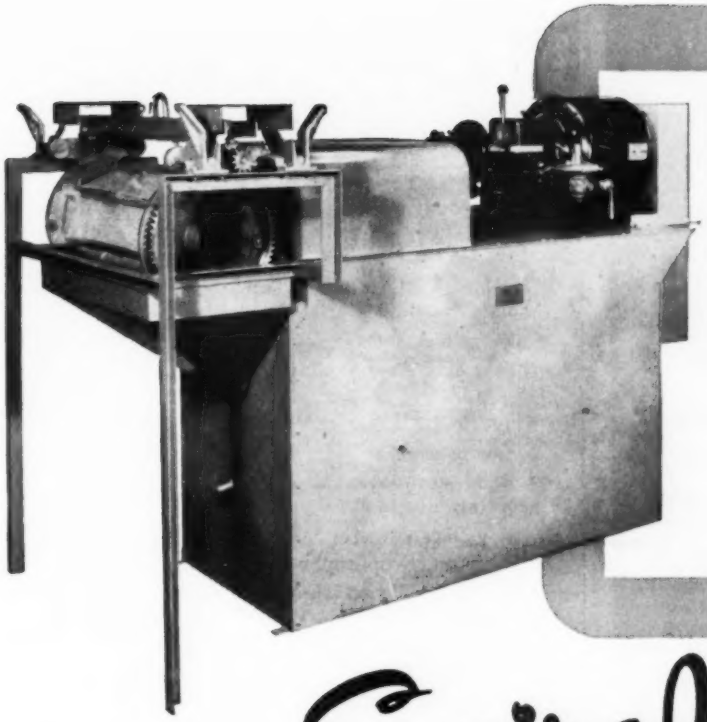

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Patent Abstracts

GEORGE B. HOGABOOM

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D. C. Price 25 cents each.

No. 2,658,032, November 3, 1953—Electrodeposition of Bright Copper-Tin Alloys—Charles L. Faust and Wilbur G. Hespenheide, assignors by mesne assignment to The City Auto Stamping Company, Toledo, Ohio.

EXAMPLE 1

Components	*Amount*
Potassium cyanide (KCN)	25.0 g/l
Cuprous cyanide $(Cu_2(CN)_2)_2$	18.8 g/l
Potassium pyrophosphate $(K_4P_2O_7.3H_2O)$	40.0 g/l
Stannous sulfate ($SnSO_4$)	10.8 g/l
Potassium orthophosphate (KH_2PO_4)	7.0 g/l
Hide glue	0.1 g/l
Balance water	
*p*H glass electrode	9.0
Temperature	140° F
Potential	3.8 volts
Current density	30 amp/sq ft
Composition of deposit	54 per cent copper and 46 per cent tin

CLAIM 4. A solution for plating an alloy from 5 to 95 per cent copper and the balance tin on a basis material having a *p*H of from about 6.5 to about 10.5 and comprising essentially from 8 to 300 grams per liter of a pyrophosphate compound selected from the group consisting of ammonium, potassium and sodium pyrophosphates, from 2 to 230 grams per liter of a soluble cuprous compound selected from the group consisting of cuprous cyanide and halide, from 2 to 350 grams per liter of a cyanide selected from the group consisting

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ZRC-8—A zinc reverse current cleaner. Four oz. per gallon, reverse current, 5–6 volts, 20–30 amps. per square foot—160° F. to 165° F.

JSC-8—A general purpose plater's cleaner for steel, iron, brass, bronze and zinc. Designed for the job shop. 4–6 oz. per gallon, direct current followed by flash reverse—5–6 volts, 30–50 amps. per square foot.

CS-8—Chrome stripper; aqueous solution—4 oz. per gallon, reverse current at 6 volts, room temperature. Strips chromium without damage to base metal.

HDS-8—Heavy duty soak cleaner; 5–8 oz. per gallon, 180° to boiling; rapid cleaning, long life, excellent emulsification.

HDA-7—A combination emulsifier and wetter used to fortify HDS-8 for a particularly tough job or where contamination runs extremely high. Add 1 oz. to each gallon HDS-8 solution.

HOT STRIP-8—Heavy duty paint strip designed to remove synthetics and baked enamels rapidly.

RPC-7—Water displacing rust protective coating.

SR-6—Scale remover designed for rapid removal of scale and rust; operates at room temperature.

RCH-8—A reverse current heavy duty cleaner and smut remover; 8 oz. per gallon, 180° F. to 200° F., reverse current, 6–7 volts, 75 to 100 amperes per square foot.

DEFLOCCULATOR-8—Paint deflocculator—non-foaming. Concentration ⅛ to ¼ oz. per gallon.

PC-6—Rust remover and phosphate coating; may be used in concentrated form or reduced with water to a 25% solution. Increase in concentration or in temperature (up to 140° F. to 150° F.) increases speed of reaction.

MG-6—Replacement for hydrofluoric acid in Dow 7 process.

ESTOX FLUX 100—For welding of cast iron.

ESTOX FLUX 200—For brazing of stainless steel.

HOLDENFLUX—An ideal paste silver brazing flux for brazing that is easy on the hands.

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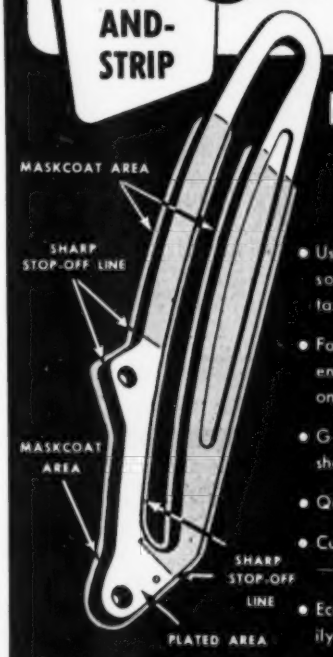

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ASI-300	300 gal/hr	2' x 2' x 2'	125 lb
ASI-400	400 gal/hr	2' x 2' x 2'	135 lb
ASI-600	600 gal/hr	2' x 2' x 2'	150 lb

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Patent Abstracts

of ammonium, potassium and sodium cyanides, from 2 to 50 grams per liter of a soluble stannous compound selected from the group consisting of stannous chloride, pyrophosphate and sulfate, from 5 to 120 grams per liter of an orthophosphate compound selected from the group consisting of ammonium, potassium and sodium mono-, di-, and triorthophosphates, from 0.01 to 5.0 grams per liter of a material selected from the group consisting of glue, gelatin and hydrolysis products thereof, and water.

11 claims, 7 examples, 2 tables.

References cited: U. S. Patents 1,536,859; 1,970,548; 1,970,549; 2,079,842; 2,216,605; 2,397,522; 2,436,316; 2,468,825; 2,511,935.

No. 2,660,554, November 24, 1953—Bright Gold and Gold Alloy Plating Baths—Barnet D. Ostrow, Brooklyn, N. Y.

It is further among the objects of the present invention to provide a bath of the character described which will deposit gold and its alloys in such a state that no finishing operations are necessary thereon and particularly avoiding the necessity for burnishing or buffing the surface of the deposit.

Example 1	*Grams per liter*
Gold metal	1.5 added as gold cyanide
Copper metal	1.0 added as copper sulfate
Nickel metal	4.0 added as nickel sulfate
Ethylenediamine	35.0
Theoretical free KCN	+2.0
Water to make	1 liter
H_2SO_4 to *p*H	10.5; range 8.0 to 11.5
Temperature	140° F
Current density	5—100 amp/sq ft

Claim 1. An electrolytic bath for plating metallic material selected from the group consisting of gold and gold-base alloys comprising an aqueous solution of aurous cyanide having therein a sufficient amount of an amine taken from the class consisting of alkylene and

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- ADAPTABLE TO HIGH SPEED PLATING
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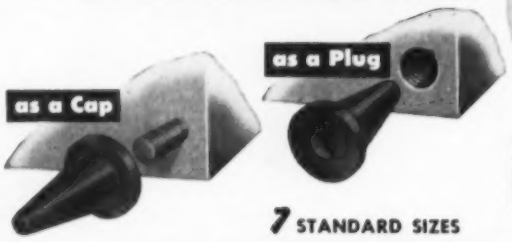

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Patent Abstracts

alkylol-amines having 1 to 12 carbon atoms to produce a brighter deposit than is obtained by plating from said bath in the absence of said substance, and containing about 1.5 to 2.0 grams of theoretical free alkali metal cyanide, the *p*H being from about 8.0 to 11.5, whereby heavy gold deposits which do not require burnishing are obtained by electrolytic deposition.

5 claims, 4 examples.

References cited: U. S. Patents 1,818,179; 1,991,995; 2,048,591; 2,195,454; 2,355,070; 2,452,308. Gilbertson et al: Transactions Electrochemical Society, Vol. 79 (1941), pp. 439–442. Weisberg et al: Transactions, Electrochemical Society, Vol. 80 (1942), pp. 510–512.

No. 2,661,328, December 1, 1953—Method of Flow Brightening Tin Plate—Edwin J. Smith, assignor to National Steel Corporation.

CLAIM 2. In the process of treating electrolytic tin-plate strip in which the tin-plate is passed through a flow-brightening zone and the tin coating melted—the steps comprising, passing the strip from the flow-brightening zone and precooling the molten tin coating by counter currently flowing cooling gas along the surface of the tin coating without affecting solidification of the molten tin, and then passing the precooled strip through a bath of quench water having a temperature not above 135° F and solidifying the tin coating in the quench bath without producing quench stains or snow balls.

10 claims, 1 figure.

References cited: U. S. Patents 2,085,543; 2,357,126; 2,418,087; 2,420,377; 2,490,084.

No. 2,661,330, December 1, 1953—Method of Electropolishing Sterling Silver—Frederick Sullivan, assignor to Arthur D. Little, Inc., Cambridge, Mass.

CLAIM 1. A method for anodic polishing silver-copper alloys containing at least 90 per cent silver in an electrolytic cell containing a cyanide bath, which comprises the steps of applying electric current and a

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potential difference between such silver-copper alloy as the anode surface, and the cathode of the cell, and of imposing a cycle of movement of the anode in and out of the cyanide bath at a rate equal to at least 10 cycles per minute, said potential difference between such alloy as the anode surface, and the cathode of the cell during the period of immersion being below that which will form permanent discoloration and above that which will form etching, until the silver alloy acquires a polish thereon, said cyanide bath containing at least 0.35 mol of free cyanide.

3 claims, 1 chart, 6 tables.

References cited: U. S. Patents 1,583,891; 2,416,294. "Metal Treatment" 1947, pp. 161–163.

No. 2,662,852, December 15, 1953—Preparation of a Two-Sided Mosaic Screen—G. K. Teal, assignor to Bell Telephone Laboratories, Inc.

CLAIM 1. The method of forming a two-sided mosaic screen or target comprising the steps of placing a large number of tiny hard particles on a metal layer, pressing the particles into and through said metal layer thereby forming a large number of apertures in the layer, applying a metal coating to said layer leaving a thickened apertured screen which has sharp metallic projections therein, electrolytically polishing the thickened screen to reduce said projections, electroplating said layer to increase the thickness thereof, insulating the inner surfaces of the apertures in the metal layer and forming metallic buttons in said apertures.

2 claims, 23 figures.

References cited: U. S. Patents 1,792,197; 2,103,623; 2,163,480; 2,175,701; 2,225,733; 2,352,968; 2,412,058; 2,496,299; 2,496,961; 2,596,617; 2,596,618.

No. 2,662,853, December 15, 1953—Electrodeposition of Nickel—David G. Ellis, assignor to Harshaw Chemical Company.

CLAIM 1. A method for electrodepositing nickel in the form of a deposit which is bright as taken from the plating solution without further treatment and which comprises electrolyzing an aqueous acid solution of a nickel electrolyte of the class consisting of nickel sulfate, nickel chloride, and mixtures of nickel sulfate with nickel chloride, said solution containing cooperating addition agents capable of imparting brightness to the deposit, one of said addition agents being a polyalkylene amine of the class consisting if unsubstituted amines of the general form

$$H_2N\,[(CH_2)_m\,NH]_n\,(CH_2)_m\,NH_2$$

where m is an integer from 2 to 4 inclusive and n is an integer greater than 2, and polyalkylene amines which are condensation products produced by reacting a polyalkylene amine of said general form with a material of the class consisting of epichlorhydrin, acrylonitrile, methyl sulfate, chloracetic acid, epichlorhydrin with phenol, dimethyl chloracetal, benzene sulfonyl chloride, and styrene oxide, soluble in said solution to the extent of at least 0.0001 gram per liter, and having a molecular weight from 100 to 1800, and the other of said addition agents being an organic compound of the class consisting of benzene monosulfonic acid, benzene disulfonic acids, monochlor benzene monosulfonic acids, benzene monosulfonamide, saccharine, dichloro benzene disulfonic acids, 2,5-di-bromo benzene sulfonic acid, toluene sulfonic acids, benzaldehyde sulfonic acids, diphenyl sulfonic acids, benzene sulfonyl chloride parachloro benzene sulfonamide, xylene sulfonamides, paratoluene sulfonamide, thiophene sulfonic acids, diphenyl sulfone, naphthalene-1,5-disulfonic acid, sulfonated naphthalene, alpha naphthalene monosulfonic acid, beta naphthalene monosulfonic acid, o-toluene sulfonamide, chloro naphthalene disulfonates and the sodium, potassium, and nickel salts thereof, said first mentioned addition agent being present in concentration from 0.0001 to 0.01 gram per liter, and said second mentioned addition agent being present in concentration from 0.2 to 15 grams per liter.

12 claims, 3 tables.

References cited: U. S. Patents 2,294,311; 2,355,070; 2,393,741. Raub et al: Metal Finishing, June 1940, pp. 315–316.

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AES News

Plating Staff Change

Burnley

Dietrich

H. George Burnley of Saddle River, N. J., was named to the position of Advertising Manager of PLATING, it was announced this month.

Burnley, a 39-year-old advertising executive with more than 15 years in the magazine advertising and production fields, was more recently employed for 10 years by Art Digest Magazine of New York City as Advertising and Business Manager.

A veteran of World War II, he fought with the Infantry in the Battle of the Bulge, Colmar Pocket and Ruhr Pocket. He holds the Bronze Star Medal and the Purple Heart. Burnley is a Captain in the Army Reserve and is assigned to the 410th Engineer Brigade in New York City.

He attended New York University, is married and has two children.

Burnley succeeds Walter C. Dietrich, PLATING advertising manager since 1949, who, on the advice of his physician, submitted his resignation recently.

"Pot Presentation"

National AES President Dr. George P. Swift (center) receives Award of the Pot from Past President Kenneth M. Huston (right) as Vincent J. Hughes, President of the Baltimore-Washington Branch looks on. Presentation featured Annual Meeting of the B-W Branch on March 13 in Baltimore.

President Swift becomes 16th AES leader to receive Order of Pot Award. Pot is presented annually to outgoing National President for "outstanding services rendered" by the Order of the Pot, an organization of National Past Presidents of the AES.

Research Committee Baltimore Meeting

The AES Research Committee, under the chairmanship of Dr. Earl J. Serfass, held its regular meeting in Baltimore, Md., on March 12 at the Lord Baltimore.

Reports were heard on various projects and further recommendations were presented on the possibility of AES research projects in Australia.

Chairman Serfass cited the importance of initiating new projects and asked members to submit recommendations by next meeting time.

He praised branches who were making contributions to the Research Fund "above and over" the per capita tax remittance. The Committee, recognizing that a branch cannot be considered as a "Sustaining Member" under the provisions of the AES Constitution and By-Laws, voted to define an individual or Branch not coming under these provisions, as a "Contributor."

Members who attended the Research Committee meeting included Dr. Serfass; Dr. Edward Parker; National AES President Swift; Myron B. Diggin; Leslie C. Borchert; Dr. William Blum; Edward B. Bowerman; guest Dr. Abner Brenner; and Executive Secretary Kovatis.

AES Represented at NTTCIW Meeting

Dr. C. Fred Gurnham and Dr. D. Gardner Foulke as member and alternate, respectively, attended the January 14-15 meeting of the National Technical Task Committee on Industrial Wastes in Cincinnati, representing the metal finishing industry by virtue of appointment by AES President Dr. George P. Swift.

Created by an Act of Congress to stimulate more effective working conditions and relationships on the technical phases of the work of improving the quality of waters between industry and federal, state and local governmental agencies, the NTTCIW is concerned with promoting research on utilization, treatment and control of industrial wastes.

All industrial operations have been grouped into four major classes with electroplating and metal finishing falling into the Chemical Processing Group. Dr. Gurnham was elected Chairman of this Task Group.

AES Editorial Board Meets in Chicago

More than 17 items of business were transacted at the regular meeting of the AES Editorial Board convening at the Chicago Conrad Hilton Hotel, Friday, January 29.

The close-to-5-hour session took action on the following: recommended at least three papers for each day of the forthcoming New York convention; suggested the publishing of a "tricks-of-the-trade" column with an award of $10 for each "trick" published; reviewed a suggested cover format for PLATING; suggested a change in the name of PLATING; recommended the addition of cartoons and humor in the official organ; heard a report on and concurred in the proposal to broaden the AES base; approved 15 papers submitted for presentation at the forthcoming convention; discussed the possibility of a "management" column; and approved a plan for brief biographical sketches of contributing authors in PLATING.

Drs. W. Blum and R. Schaefer, official AES representatives to the 4th International Conference on Electrodeposition and Metal Finishing, London, England, April 20-24, 1954

Members of the Editorial Board were guests at a luncheon of The Udylite Corporation Saturday and that evening were guests of the Chicago AES Branch at its Annual Banquet.

Present at the January meeting were J. Andrus, H. McAleer, D. Gray, E. Bowerman, M. Nadel, F. Fulforth, W. Geissman, L. Diveley, L. Morse, A. Korbelak, P. Kovatis; National Officers Dr. R. Schaefer, C. Kelly; New York Convention Chairman G. Schore, Cleveland Convention Chairman E. Combs.

Next meeting of the Editorial Board is scheduled for July 14 aboard the N. Y. Convention Excursion Steamer.

Speakers at B-W Meeting, March 13

Dr. George P. Swift, National President of the AES, looks over Baltimore-Washington Branch Annual Meeting program with Educational Program speakers. Left to right: M. B. Diggin, Hanson-Van Winkle-Munning Co.; Dr. Swift; Dr. R. B. Saltonstall, Udylite Corp., and H. Head, Briggs Mfg. Co. Dr. A. Brenner, National Bureau of Standards, was the Chairman of the Educational Session.

Branch News

Coming Events

BOSTON BRANCH

18TH ANNUAL EDUCATIONAL SESSION AND DINNER-DANCE
at 1:30 P.M. and 7:00 P.M., respectively
Saturday, May 1, 1954
Statler Hotel, Boston, Mass.

SPEAKERS AND PAPERS

BRUCE E. WARNER, New England Plating Co., Worcester, Mass., "Management Problems of the Metal Finishing Shop"

RAYMOND J. O'CONNOR and WALTER ROTZAL, Contract Plating Co., Stratford, Conn., "Job-Shop Pricing"

RAY A. HOEGH, JR., Mercil Plating Equipment Co., Chicago, Ill., "Plating Barrels: Construction and Use"

MILWAUKEE BRANCH

ANNUAL EDUCATIONAL MEETING AND BANQUET
Saturday, April 24, 1954
at the Schroeder Hotel
EDUCATIONAL SESSION
10:00–11:30 A.M. and
1:30–3:30 P.M.
Banquet at 7:30 P. M.

Reflecting the trend of the times, the program will have as its theme, "Metal Finishing in Today's Competitive Market."

PAPERS AND SPEAKERS

ARTHUR M. LINN, United Chromium, Inc., "Bright Nickel Plating in Today's Competitive Market"

C. O. HUTCHINSON, Sales Manager, Nubian Industrial Division of The Glidden Co., "Organic Finishing for Today's Competitive Market"

KEN HUSTON, Rustless Division Armco Steel Co., "Stainless Steel in Today's Competitive Market"

LOUIS J. MINBIOLE, JR., Udylite Corp., "Plating in Today's Competitive Market"

ROCKFORD BRANCH

ANNUAL EDUCATIONAL SESSION AND BANQUET
1:30 and 6:30 P.M., respectively
Saturday, April 3, 1954
Faust Hotel, Rockford, Ill.

SPEAKERS AND PAPERS

CLYDE KELLEY, Northwest Plating Co., Chicago, and AES 2nd Vice-President, Session Chairman

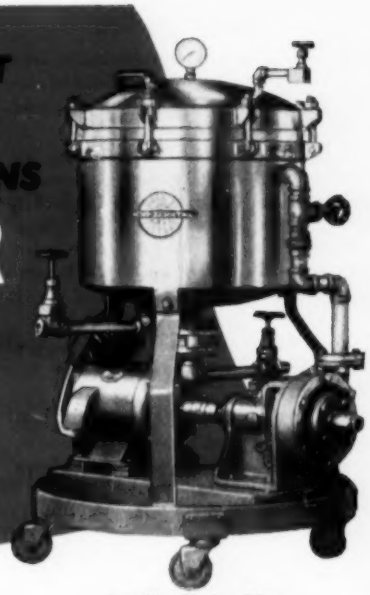
S. J. FECHT, S. J. Fecht & Associates, Chicago, Ill., "Work Simplification Programs for the Metal Finisher"

WILLIAM JACKSON, Udylite Corporation, Detroit, Mich., "Barrel Plating"

GEORGE CARLSON, Acme Machine Co., Detroit, Mich., "Automatic Buffing Brought Up to Date"

FOR LOW COST FILTERING OF PLATING SOLUTIONS

SPARKLER HORIZONTAL PLATE FILTERS



Sparkler Plating Filter
Model 18-D-6 Alliron
600 G.P.H. Portable

HERE'S HOW

★ On a horizontal filter plate it is possible to apply a thin pre-coat with about one-third the filter aid, and in one-third the time required for pre-coating a non rigid media or a surface in a vertical position. This saves time and filter aid.

★ With the Sparkler horizontal plate you can apply this thin pre-coat evenly over the entire plate surface and start filtering immediately with less pressure and obtain maximum consistant clarity right from the start up to the end of the cycle.

★ A filter cake on a horizontal plate will not crack, slip or fall off even with varying pressure or a complete shut-down of the filter. No pre-coat renewal is ever required after an interruption in operation.

★ When it is necessary to clean the filter, the Sparkler filter tank can be emptied in a matter of minutes with a minimum of loss of valuable plating solution.

★ Any grade of filter paper from fine to coarse can be used in a Sparkler filter. This makes it ideal for carbon treatment of solutions. Carbon mixed with water in a stand-by tank is circulated through a clean set of filter paper on the plates until a carbon cake is formed. The solution requiring carbon treatment is then circulated through the carbon beds without contaminating the plating tank or a shutdown of plating operations.

★ At the end of the cycle with a Sparkler filter you can blow-down with air and produce a relatively dry cake that can be disposed of in a trash can rather than washing it down the drain with attendant sewer clogging problems.

★ You will find your Sparkler plating filter positive and dependable from a standpoint of uniform high quality filtering and economical in labor and material.

SPARKLER

Sparkler representatives in all principal cities are ready to give you personal service on your filtering problems, and show how you can make a material saving in operating cost.

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Mundelein, Illinois

Sparkler International Ltd.
Prinsengracht 876, Amsterdam, Holland

Sparkler Western Hemisphere Corp.
Mundelein, Ill. U.S.A.

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CHICAGO BRANCH

The branch scored another rousing success with its 42nd annual educational session and banquet held at the Conrad Hilton on January 30.

Congratulations are in order for all those who helped make this gala occasion possible, especially to BRANCH LIBRARIAN R. HAHN, for his planning of the educational session, and to Ed Stanek who, with the assistance of his banquet committee, and the helpful advice of RUDY HAZUCHA, can boast of a job well done.

Three excellent papers were presented at the afternoon educational session attended by about 300 persons.

"Alkaline Derusting as a Modern Plating Tool," the first paper of the session, was ably presented by LLOYD GILBERT of the Rock Island Arsenal.

The paper, presented by DR. ALLEN G. GRAY, Technical Editor of Steel, entitled, "What's Ahead in Plating," was an optimistic view of 1954.

The final paper by HARRY W. HOWARD of the Shell Chemical Corp. was entitled "Organic Finishes Based on Epon Resins."

Chicago's Plating Man of the Year, Lawrence Hay, left, receiving plaque sponsored by the National Federation of Metal Finishers from AES 2nd Vice-President Clyde Kelly, right. The presentation was a feature of the Chicago Branch Annual Banquet

Among the out-of-town guests attracted to this meeting were: RALPH SCHAEFER, AES 2nd Vice-President; FRED FULFORTH, BILL GEISSMAN, KEN OLSEN and ART NOEL.

Following the educational session and a short rest period, the group reconvened, with their ladies, to enjoy one of the finest banquets in branch history. Over a thousand people turned out to enjoy a gala evening.

The technical meeting, on February 12, as usual, was preceded by a cocktail mixer, the branch business meeting and dinner. After dinner about 40 members of the branch gathered in the auditorium of the Western Society of Engineers to hear an interesting presentation by JOSEPH POKORNY, service manager, G. S. Blakeslee Co., on the subject, "Vapor Degreasers vs. Power Washers."

According to Pokorny, power washing, a process essentially involving the spraying of alkaline type cleaners at high ve-

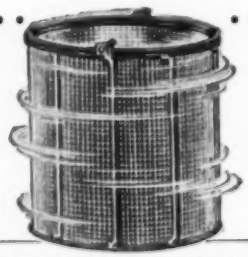
Lloyd Gilbert, top, and Harry Howard, bottom, two of the speakers at the Chicago Branch Annual Meeting

DRIES SMALL PARTS *Faster–Better..*

DOES IT FOR LESS!

Kreider Dryer with auxiliary gas heating unit (illustrated). Auxiliary steam heating unit available; also standard model without auxiliary heating.

Basket (shown below). Heavy gauge steel woven mesh over steel frame. Capacity, 1140 cu. ins.



Spin-Dries* up to 50 pounds in less than 2 minutes

Simple design . . . careful engineering, sturdy construction assure trouble-free, low-cost maintenance operation. Operates at 625 r.p.m. on less than 1 h.p.

No scarring or marring . . . with Kreider Dryer. Centrifugal force holds parts immovable in basket . . . assures smooth, evenly dried surfaces, long-lasting luster, minimum "rejects".

One man runs it! Standard model Kreider Dryer occupies less than 6 sq. ft. floor space. One man tends—loads, unloads—keeps production moving, prevents expensive, time-wasting tie-ups.

See for yourself! Write Department PL454. for illustrated 4-page folder . . . also addresses of installations near you.

New Holland Machine Co., New Holland, Pa.

***Only 2 simple steps required . . .**

(1) Operator places wire mesh basketful of small parts in Dryer . . . turns motor "ON."

(2) Operator turns motor "OFF" . . . presses foot brake . . . removes basket.

NEW HOLLAND *KREIDER* DRYER

BRP

ELECTROLESS NICKEL

Deposits a uniform thickness on any irregularly shaped part.

Thickness of .003 can be made with excellent adhesion.

Corrosion-resistance properties are superior to those of electroplated nickel.

Hardness similar to that of hard nickel and can be increased by heat treating.

Solutions are shipped in concentrated form, in order to reduce handling and storage requirements.

Our experienced personnel, with years of experience in the operation of Electroless Nickel, assures you competent service engineers for the correct solution of your individual requirements.

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THE VEA CHEMICAL CO.

MANUFACTURING CHEMISTS TO THE METAL FINISHING INDUSTRY

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locities on the work to be cleaned, can do some jobs that a vapor degreaser cannot handle. Conversely, the vapor degreaser can handle some jobs that the power washers cannot do. However, either method can be used satisfactorily for most jobs.

A warm welcome was extended to three new members. They are: RICHARD HEMMINGWAY, F. ALLEN PALMER, and JOHN PAVLOWSKI. A cordial welcome was also extended to the General American Transportation Co., who have just joined the Society as a sustaining member.

JEROME KUDERNA,
Publicity Chairman

Cleveland Branch TV Committee (l. to r.): L. Ridenour, J. D. Little, Howard Blouch, E. J. Roehl (Chairman), A. H. DaRose

CLEVELAND BRANCH

The Cleveland Technical Societies Council has sponsored several series of half-hour TV programs over station WNBK, the programs being prepared and presented in turn by the member societies of the CTSC. Each series covers the school year and is given under the general title, "Adventures in Engineering and Science." On every program there appears as one of the participants a high school student from the area, chosen by the TV Committee of the CTSC. Programs are aimed at acquainting high school students as well as adults with the technical or engineering background of the work of the members of the respective societies.

The Cleveland Branch presented the program on January 17. A committee was appointed which organized and wrote the script. The participants on the program were HOWARD BLOUCH and JACK LITTLE of the AES, BILL MOSELEY, the high school student, and the station host, PAUL BEDFORD.

The program was presented in the form of a series of questions and answers. The fundamental steps in plating operations were illustrated by means of beaker-size experiments, and the effect of an addition agent in tin plating was vividly shown. Additional props used were: a plating barrel, anodes, plating racks, charts and samples of plated parts illustrating decorative and functional uses. A number of slides were shown to illustrate electroforming, the plating of wire screen, the tin plating of continous steel strip, and other operations. A short section of a movie film, showing an automatic plating machine in action, also was used.

The part the various engineering sciences play in the electroplating field, and the research program of the AES also were discussed.

E. J. ROEHL,
Chairman, TV Committee

Branch Contributors
To AES Research Fund
(In addition to per capita tax remittances)

Los Angeles	$100.00
Twin City	100.00

The above branches are to be commended for doing something "extra" for AES Research.

DALLAS-FORT WORTH BRANCH

A regular meeting was held on January 20, at the Lennox Hotel, Grand Prairie, Texas.

A panel of speakers was presented to the group to discuss various phases of interest to the platers in the area. First speaker was PERCY KING, process engineer, Consolidated Vultee Aircraft Corp., Fort Worth. King gave a very informative talk on electroforming of phonograph record matrices. He presented samples of work and drew from his experience of some years past when he was foreman of Allied Records in Los Angeles. The next speaker was E. R. REINHARD, general process foreman, Chance Vought Aircraft Inc., Dallas. His presentation was a discussion with samples of colored anodizing. This was chromic acid anodizing and there were some very unusual effects. Reinhard had done considerable work along this line in job shop work and with the United States Navy in Seattle, Wash. Final speaker was TED HOLMES, sales manager, Electro Process, Inc., Buffalo, N. Y. He gave a very instructive talk on the principles of electropolishing and the latest developments in this field.

The February 17th meeting was held at the Lennox Hotel with 31 visitors and members present.

It was a real pleasure to have R. V. VANDENBERG, head of the finishes division of Alcoa Process Development Laboratories, New Kensington, Pa., as the speaker. Presenting his talk with the use of slides, VandenBerg covered the field of electroplating and anodizing of aluminum alloys from its early beginnings up to the latest developments. Of considerable interest to the aircraft people and electroplaters was the visual evidence of the variation in aluminum alloys and the way they respond to chemical treatments both in plating and anodizing. It was good to hear some of the story on the new hard anodizing process and to see some of the evidence of this work.

R. H. HEPPEL, *Publicity*

DETROIT BRANCH

PRESIDENT BONCHERT called the February 5th meeting to order at 8:20 P.M. with approximately 135 members present.

SECRETARY R. J. RACINE announced 37 new applicants for membership and all were voted into the society. A great number of these new members were from Cadillac Motors. This brings the total branch membership to 586. Let's all get behind the good work of MEMBERSHIP CHAIRMAN JOE GURSKI and raise this total to 600.

Guests for the evening were GILBERT EXTALE, General Electric Co., Ontario, Calif., and CHUCK FORBES, Rockwell Spring and Axle Co., Pittsburgh.

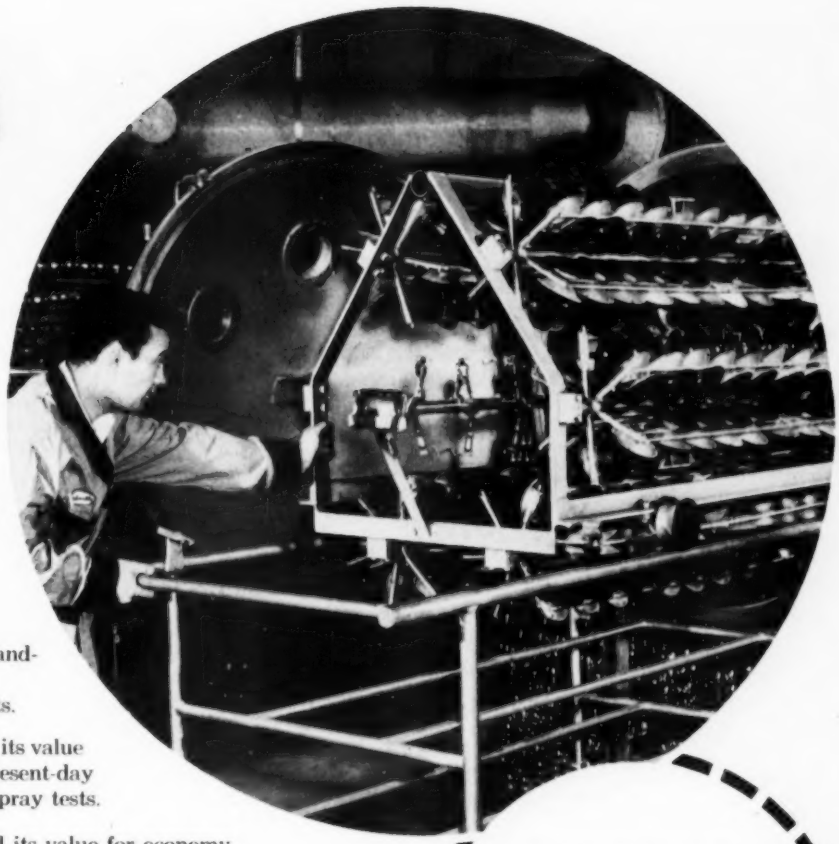
LEE MORSE announced that the Reed Plating Co. of Detroit is a new sustaining member of the Society's Research Program.

Lists of new officers and delegates were presented, the delegates to be nominated. It was moved and passed that HERB HEAD also would be placed up for nomination as a delegate.

The evening movie, "Wings to Hawaii," depicted the beautiful sights to be seen in the hopeful 49th state.

EDUCATIONAL CHAIRMAN OLMSTEAD presented the speaker of the evening, DR. LOWENHEIM, Metal and Thermit Corp., whose talk was "Plating of the Alloys." Lowenheim mentioned that tin has always been prominent in alloy plating. Many of the baths are of the stannate-cyanide type. Tin-zinc alloy plating was an early substitute for cadmium. This has ex-

Vacuum Metallize for High-Speed Low-Cost Finishing of Stampings and Die Castings



Packard parking lamp reflectors—720 to a load—enter the Stokes Vacuum Metallizing chamber at Detroit Plastics Molding Co., a leading metal finisher and plater. In a matter of minutes these reflectors will be brilliantly metallized.

Leading metal finishers are expanding their markets by vacuum metallizing many metal products.

Vacuum metallizing has proved its value for wear. The finish outwears present-day chrome plating 10 to 1 in salt-spray tests.

Vacuum metallizing has proved its value for economy. Without buffing or polishing it gives a brilliant reflective surface.

Vacuum metallizing has proved its versatility. Colors can be applied throughout the spectrum from a silvery aluminum to brilliant, transparent undertones. Brass, copper, bronze, and gold are commonly employed.

Lighting fixtures, cabinet hardware, door knobs, drawer pulls, handles, reflectors, emblems, trophies and display materials are a few among many products which are less and less being electroplated, more and more vacuum metallized. Automobile hardware is now a rapidly growing market.

Stokes Vacuum Metallizing units of 24, 36, 48 and 72-inch diameter are available, some fully automatic in operation. Floor space requirements are low, as these are integrated "package" units of the fastest and most efficient type. Some installations deliver as high as 100 loads of finished parts per 24-hour day without use of specially skilled labor. Stokes trains your workmen and you start into production.

Stokes Laboratory will metallize your samples, evaluate your application, recommend techniques to be employed, plan cycles, report on costs . . . and share with you the benefits of Stokes' 40 years of leadership in high-vacuum technology.

Write today for a comprehensive brochure, "Vacuum Metallizing Today," which describes the applications and techniques of Vacuum Metallizing.

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STOKES MAKES: High Vacuum Equipment, Vacuum Pumps and Gages / Industrial Tabletting, Powder Metal and Plastics Molding Presses / Pharmaceutical Equipment

cellent solderability after long exposure in storage, which is a marked advantage over cadmium and important to the electronic industry in that it cuts down galvanic effects. Samples were shown of tin-nickel alloy plating. Chromium can be deposited over tin-nickel deposits but parts must be activated. Advantages in that only 1/3 as much nickel is required as compared to the customary nickel plating. The hardness range is between that of nickel and chromium. There are certain requirements for tin-nickel alloy plating in which bagging the anodes and filteration were mentioned. Corrosion tests were reported as being good.

Copper and tin-cadmium alloy deposits also were mentioned.

JOHN DRINKWATER,
Publicity Chairman

GRAND RAPIDS BRANCH

The December 11 meeting was held at Fingers Restaurant with approximately 45 members present. PRESIDENT YHOUSE opened the meeting with the election of 4 new members as follows: R. O. WOODHOUSE, ROY BAKER, JOHN GIFFORD and LEO WISEMAN.

LIBRARIAN LYMAN SPERRY then introduced DR. STUART CARR, Bart Products, Inc., Belleville, N. J. Carr gave an excellent review of nickel electroforming, centering his discussion on:

1. What electroforming is and is not.
2. Its application.
3. Its advantages.
4. Material and type of mandrels.
5. Type of electroforming bath.

Following the review, a brief discussion period was held, after which refreshments were served to all.

JOHN DYKSTRA, *Secretary*

KANSAS CITY BRANCH

A regular monthly meeting was held January 28 at Roselli's Restaurant. Dinner was at 6:30 P.M., followed by the business meeting at 7:30 P.M. There were 21 members and 4 guests present.

PRESIDENT L. E. BARKLEY opened the meeting with a brief resume of the joint AES-ASM Christmas party which was thoroughly enjoyed by the 243 persons in attendance at the Continental Hotel roof garden.

The speaker for the evening, P. W. SODERBERG, Bruce Products Corp., Howe, Mich., presented a very informative paper on "Polishing With Liquid Spray Compounds." His talk was followed by an interesting discussion session.

At the February 25th meeting there were 31 members and 7 guests present.

President Barkley reported on the meeting of the officers and board members held on February 11.

The entertainment committee was given the approval to make plans for a stag party to be held in June.

It was decided that the March meeting should be a business meeting with an election of officers.

The speaker of the evening, GERALD LUX, Oakite Prodicts, New York, N. Y., was introduced and gave a very informative presentation of the "Fundamentals of Alkaline Cleaning." This presentation was followed by a discussion session.

OLIN K. BOCK, *Secretary*

LOUISVILLE BRANCH

A regular meeting was held on January 21 at Korfhages Restaurant, with a dinner at 6:30 P.M. PRESIDENT P. H. PATE opened the formal meeting at 8:00 P.M. with 26 members and guests present.

After reports of special committees and the reading of correspondence, a summary of the recent questionnaire relating to branch meetings was presented.

The Treasurer's report then was read and accepted. President Pate turned the meeting over to EDUCATIONAL CHAIRMAN S. J. BEYER, who after a brief talk introduced C. H. CASTLE, Roto Finish Co., Kalamazoo, Mich. Castle spoke on the subject of "New Roto Finish Machines" —the Roto-Tron and the Roto-Matic. His talk may be summarized as follows:

1. Deburring, descaling, cutting down and other finishing operations of small parts, stampings and die castings can be finished economically by tumbling operations using aluminum oxide, limestone, and other compounds.
2. Cleaning of small parts can be done by tumbling operations. Burrs are removed the same time by the use of newer compounds now on the market.
3. Tumbling barrels now are lined with neoprene or rubber to replace the wood linings formerly used. Multiple compartment cylinders are used for different shaped parts replacing the single compartment cylinders.
4. A Roto-Tron machine is similar to a washing machine in action. It has an oscillating motion and removes burrs by using aluminum oxide and appropriate compounds.
5. A Roto-Matic machine is a circular tub on spindles which raises up and down.

Samples of processed parts were shown. Following the talk, a General Electric Co. film entitled "Jet Propulsion" was shown. Refreshments were served through the courtesy of the Roto Finish Co., Kalamazoo, Mich.

JOSEPH G. STERLING,
Secretary-Treasurer

MILWAUKEE BRANCH

The 20th annual dinner given in honor of WALTER PINNER was held on January 8 at the Milwaukee Elks Club.

W. Kessler, W. O'Neill, W. Pinner and G. Schwemmer pictured at Milwaukee's Annual Pinner Dinner

Approximately 100 members and guests were present. Both the speaker and the membership reminisced on a similar evening 20 years ago. Of those members present in 1934, 8 were present at this meeting. Pinner spoke on the progress of the Project 15 on a new accelerated corrosion test. In addition to this report on Project 15, he described some interesting corrosion work which is in progress at the Process Development Division of Houdaille-Hershey Corp.

The speaker was presented with a leather suitcase by LIBRARIAN JOHN SCHNEIDER as a token of appreciation from the membership for the meritorious services and wonderful lectures through the past years. After a question and answer period, the meeting was adjourned.

At the February 5th meeting at the Ambassador Hotel, the guest speaker for the evening was honored with a dinner at which about 30 members and guests were present.

The regular business meeting was gaveled to order by PRESIDENT ANDERSON with 55 members present. After two applicants were accepted as members, the Secretary made the announcement that L. DIVELEY was a candidate for the office of 3rd Vice-President of the National Society. The Secretary also announced that two members would be made Honorary Members at the next meeting.

The speaker for the evening was GENE BOSL, field electrochemist, Hanson-Van Winkle-Munning Co., and his subject, "The Preparation of Ferrous Castings for Painting and Plating," was presented very well. To illustrate points of interest, he used a number of sample castings. The main idea of the speech was that the foundry could improve methods to ease the platers' problems, but nevertheless, this is not always the easiest factor to control.

Librarian Schneider announced that the Annual Meeting would be held on April 24, and the theme for the educational sessions would be "Metal Finishing in Today's Competitive Market."

Refreshments were served through the courtesy of the H-VW-M Co.

C. PETER, *Assistant Secretary*

NEWARK BRANCH

A regular meeting was held on January 19 at the Robert Treat Hotel, Newark, N. J.

Applications for ARNOLD B. KLEIN, EUGENE N. CASTELLANO, and FRANK SALERNO were ordered to take the regular course.

EMIL MICHOTA, STEVE SZABO, HAROLD O'BRIEN, WILLIAM MULLER, ERNEST LO PRESTI, ALFRED BABINSKI, and ZOLTAN PAROCZAY, JR. were elected to membership in Newark Branch.

ROBERT J. YACKLEY was transferred from Newark to Chicago Branch.

Delegates to the interim meeting, who also will be delegates to the convention at New York, are MYRON DIGGIN, GEORGE WAGNER, JOHN GUMM, ROBERT EHRHARDT and LOUIS DONROE.

HOWARD COBB was introduced by LIBRARIAN AUSTIN as the speaker on "Distribution of Electric Current in Plating Baths."

DR. EARL SERFASS then spoke on "Instrument Analysis."

At the February 19 meeting, 82 were in attendance.

Applications for membership were received from MICHAEL PARISI and LOUIS M. BROWN and referred to the Board of Managers for review.

Eugene N. Castellano, Frank Salerno and Arnold B. Klein were elected to membership. WILLIAM A. HOPKINS was transferred to Newark from Detroit and EUGENE GWYER from Newark to Detroit.

Myron Diggin presented the following resolution which was adopted:

WHEREAS, Divine Providence has seen fit to call George B. Hogaboom from this mortal life; and

WHEREAS, The American Electroplaters' Society has lost a loyal and faithful friend who was a founder, first President, and Honorary Member from the Newark Branch,

BE IT RESOLVED, That the sympathy of the Newark Branch be extended to his family, that a copy of this resolution be transmitted to his wife, daughter and sons, and that this resolution become a part of the minutes of this meeting.

LOUIS DONROE was appointed Chairman for the Christmas Party Committee by PRESIDENT HORROCKS.

Librarian Tom Austin introduced A. P. MUNNING whose talk, "Some Thoughts on Waste Disposal," reviewed the troubles which have occurred and steps that have been taken by various agencies, including ORSANCO. He reviewed methods for acids, alkalies, chromium and cyanides and pointed out the increasing importance of waste treatment.

DR. B. GUTZEIT, General American Transportation Corp., then presented a talk on "The Kanigen Process" describing the nickel deposited by this method as harder and more brittle, more noble and corrosion resistant than electrode posited nickel as well as being nonporous and having infinite "throw." It is good for complicated shapes, large pieces, fabricated assemblies, pipe and tubes, but more expensive than electroplating for usual run of parts. The solution was described as containing nickel salts, a reducing agent (hypophosphite) and buffers to control the *p*H. The rate of deposition is 0.001 inch per hour.

L. to r., A. P. Munning, Dr. Gutzeit and T. Austin, at recent Newark Meeting

Dr. Gutzeit reported that the Group VIII metals (Fe, Ni, Co, Pt) are catalytic in that reduction can take place directly on them.

G. REUTER, *Recording Secretary*
and D. G. FOULKE,
Recording Secretary, Pro Tem

AVOID COSTLY REJECTS DUE TO UNACCEPTABLE COATING THICKNESS!

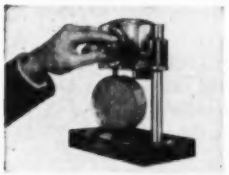
For quality control and acceptance tests, measure thickness of coatings on metals the easy, accurate, non-destructive way, with the . . .

AMINCO BRENNER **MAGNE-GAGE**

Widely used by industry and government for accurately measuring the thickness of:

1. Non-magnetic coatings (metallic or non-metallic) on magnetic base metals.
2. Nickel coatings on magnetic or non-magnetic base metals.
3. Composite copper-nickel coatings on magnetic base metals.

Measures coatings on plane, convex or concave surfaces. Gives speedy and accurate results. Easy to use by non-technical personnel.



Coating on cylindrical object being measured with the Magne-Gage.

Avoids expensive rejections due to coatings that may be too thin, or non-uniform. Eliminates the expense involved in replating or discarding specimens spoiled by destructive tests . . . every piece tested is unharmed and ready for use or shipment. Saves materials wasted by coatings thicker than necessary. Its use leads to the discovery of faults that may exist in plating methods or equipment.

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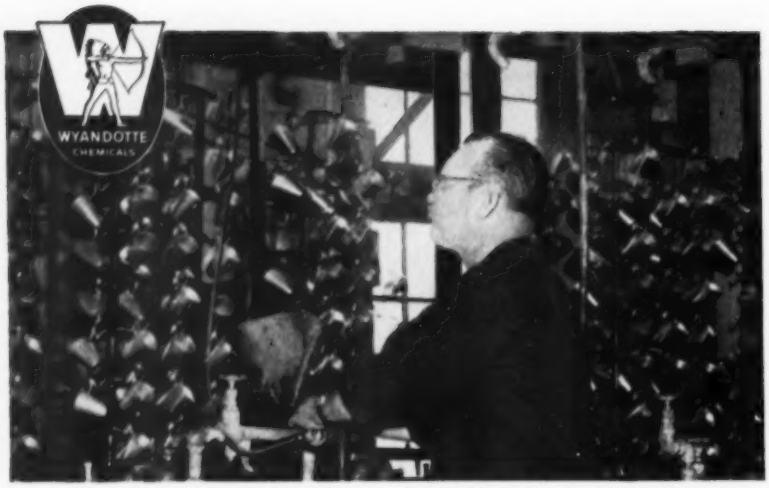

E. C. Holzem, Superintendent, Plating Industries, Inc., St. Paul, Minn.

"We use Wyandotte products 100% for cleaning prior to ELECTROPLATING!"

— Plating Industries, Inc., St. Paul, Minn.

"We are specialists in electroplating," says E. C. Holzem, Superintendent, Plating Industries, Inc., St. Paul, Minn. "We have to use the best materials in order to maintain our consistently high quality and service.

"We use Wyandotte products exclusively for our cleaning prior to electroplating.

"Our experience has been that Wyandotte not only has the highest quality products but works closely with our industry, both on a national basis and in its own research department, to constantly improve cleaning products and procedures."

The Wyandotte cleaning products used by Plating Industries are: F.S.* — a superior heavy-duty, reverse-current electrocleaner for steel; C.S.R.* — a unique reverse-current electrocleaner for removing carbon smut from steel; and B.N. — a superior, versatile electrocleaner for non-ferrous, as well as ferrous metals.

How about *your* business? Do you want research-developed and production-proved products that will improve the quality of your finishes and reduce operation costs? Contact Wyandotte! Mail coupon today for technical folder or for the services of a Wyandotte representative. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Angeles 12, California.*

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☐ Please send folder entitled "CLEANING prior to ELECTROPLATING"

☐ Have Wyandotte Representative call

Name _____ Title _____

Firm Name _____

City & Zone _____ State _____

NEW YORK BRANCH

The February 12th meeting was held at the Hotel Statler, N. Y., and was called to order by First Vice-President A. Fusco.

The meeting was turned over to P. Veit who presented Mr. Vander Pool of the Metalizing Engineering Co., Inc.

Vander Pool included the presentation of a color film with his talk to show the latest techniques in "Metalizing."

Lester Levinson,
Recording Secretary

PHILADELPHIA BRANCH

A regular meeting was held at the Engineers' Club on January 22 and was preceded by a dinner; 50 attended. President Ottens called the meeting to order at 8:05 P.M.

After routine business 5 new active members were admitted and 7 applications were received. Then Ottens appointed the following as nominating committee: Eugene Zurbach, Jr., Ralph Wirt and Thomas Lyons.

Librarian Don Volino introduced the speaker, Henry G. Orlik of RCA Victor, whose topic was "Standardization of Finishes at RCA." Orlik stressed the importance of proper finish on the salability of a product. The mismatching of the finish on detail parts was one of the basic reasons for the establishment of finish standardization. Each standard finish is assigned a number which remains during the entire life of the finish—no other finish ever uses this number. A standardizing notice is written which describes in detail the finish and methods used to obtain it. A standard size finish chip (3 x 5 inches) showing the finish is distributed throughout the company for visual and inspection purposes.

Orlik described the relatively simple tests used for testing organic finishes. He explained the method used in establishing a new finish and exhibited the forms used. He described the different types of organic finishing materials used and listed their advantages. He also mentioned that 0.0015 inch copper overplated with 0.00005 inch cadmium proved to be an excellent corrosion-resistant finish on radio chassis.

I. Wm. Marcovitch, *Secretary*

SAN FRANCISCO BRANCH

The January 14th meeting was held at the Hotel Leamington, Oakland, Calif.

After dinner the meeting was called to order and was immediately turned over to speaker and fellow-member, George Leghorn of Western Gear Works, San Carlos. He covered the subject of "Heat-Treating and Plating in the Gear Industry," including some comparisons he made on the use of copper, silver and gold for use in blanking off areas on parts to be heat-treated. He claims he is satisfied that copper is the best material.

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"Controlled Compounds" in extruded bar and liquid to meet all requirements and conditions of any job.

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Our Buffing Engineers are equipped with portable Liquimatic demonstration kits which enable them to easily show you the savings that Liquimatic can effect in your plant — on your production line. This demonstration equipment is rapidly set up, requires no assistance from your help and the test can be made on hand lathes or automatic equipment using just a compressed air connection. The demonstration in no way impedes your normal production flow.

Here is a demonstration you should see regardless of past experience or whether or not you are using a liquid compound at present! We know that we can show you that we have achieved the maximum in performance through combining the very latest in automatic application equipment with the very best in compounds — Liquimatic. This is the Liquimatic team — an unbeatable combination.

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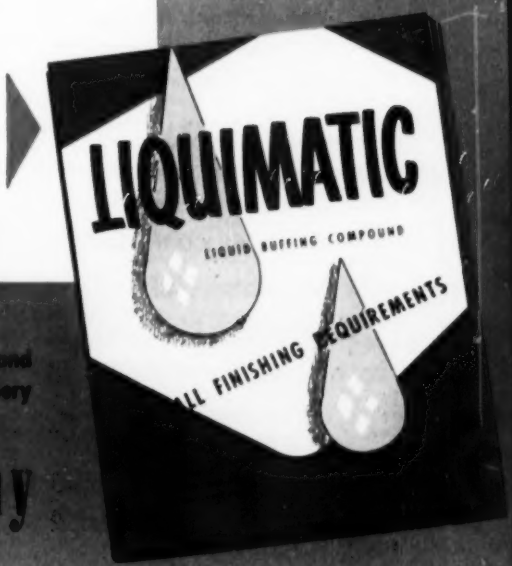

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PRESIDENT BOB HART appointed a nominating committee to select candidates for office for the coming fiscal year. The committee: HOWARD LACKEY, Chairman; FRED LANE and C. R. MCDONALD.

HORACE J. SMITH,
Secretary-Treasurer

SOUTHEASTERN BRANCH

At the January 8th meeting, 17 were in attendance. Two committees were appointed:

Committee to arrange for Ladies' Night: Chairman, DAVE HOLLAND; CLYDE STOVALL and M. JONES.

Nominating Committee: CLEM HOHNER, H. R. STOGNER, M. E. AWTRY, and BILL WEYMOUTH.

Speaker of the evening was TONY JOHNSON of the Beckman Instrument Corp., Pasadena, Calif., on the subject, "*p*H Controls and Other Instruments."

At the February 12th meeting, 19 were present, two new members, JAMES M. HALL, Physicist for American Lava Corp., Chattanooga, Tenn., and JAMES T. HALL, Salesman for F. H. Ross & Co., Memorial Drive, Atlanta, Ga., were elected and presented to the group. Nominating Committee reported and presented the following slate for coming year:

President—RAY STEFFY
1st Vice-President—CLYDE STOVALL
2nd Vice-President—WM. KELLY
Secretary—C. A. COLLINGS
(Nomination from floor for Secretary by LOUIS ROSENBERG: W. W. WEYMOUTH)
Librarian—DAVE HOLLAND
(Nomination from floor for Librarian: CLEM HOHNER)

It was moved and seconded that all members ballot for above by mail. Secretary was instructed to prepare mail ballots to all members.

Bill Kelly then presented the speaker, KEN BELLINGER of Chemical Corp., Springfield, Mass. He gave a very interesting talk on Bright Zinc.

Bellinger then screened a film showing applications of their Pla-Tank, glass fiber and resin construction material.

C. A. COLLINGS, *Secretary*

SPRINGFIELD BRANCH

At the February 22nd meeting held at the Ivy House, West Springfield, Mass., 25 were present.

PRESIDENT ED KOETSCH conducted the meeting and SECRETARY ROGER HEROUX went over some short announcements relative to the regional and the national conventions to be held in Hartford and New York City, respectively. LIBRARIAN JOHN GREENAN introduced the speaker, R. O. BAILEY of the American Chemical Paint Co., whose subject was "The Use of Inhibitors in Acid Pickling Solutions To Remove Scale from Steel."

At the short business meeting, it was announced that the New England Regional Conference will be held on May 15, 1954, at the Hotel Bond, Hartford, Conn.

ROGER HEROUX, *Secretary*

ST. JOSEPH VALLEY BRANCH

A regular meeting was held at the Hotel Elkhart, on January 6 with 32 members and guests present for the dinner and 39 at the technical session.

Two applicants were elected to active membership: JAMES WOLFE, Sales Engineer, Haviland Products, and GEORGE STAHL, plater, at the Excel Corporation.

RALPH BROUWER reported that plans for the Ladies' Night, April 7, had been completed. He also reported that the Roth Plating Corporation has been added to the list of St. Joseph Valley subscribers for a sustaining membership in the AES Research Fund.

DUANE POUCHER introduced guest speaker, N. S. CHAMBERLIN, Chemist of the Technical Service Division of Wallace & Tiernan Company, whose topic was "Treating Cyanide and Chromium Wastes."

Two guests were present from the Indiana State Board of Health: WALTER BELTER and RALPH HOLTJE. Holtje explained the purposes and aims of the State Board of Health relative to the isolation of cyanide wastes, particularly in case of tank failure which drains a big slug of cyanide into a sewer or stream. By examples and illustrations, the danger to public health and wild life was demonstrated and the need for positive preventive methods was stressed. Belter detailed various methods by which drainage of cyanide into sewers and streams could be prevented.

1. Curbing around cyanide tanks to catch the volume of the tank in case of tank failure.
2. Holding tanks below or outside the buildings with direct and isolated drainage to these tanks.
3. Curbing around the whole plating room floor with raised drains so that any cyanide waste could not get directly into the sewer. Ordinary rinse waters would be piped to the drain but in case of accident the cyanide solution would be retained on the floor without getting into the drain.
4. A combination of these methods best suited to the individual plant circumstances.

EUGENE ROTH, *Secretary-Treasurer*

SYRACUSE BRANCH

At the January 18th meeting at Bill Richard's Restaurant, Syracuse, 40 members and guests attended.

BRANCH LIBRARIAN AL GUTEKUNST introduced the speaker of the evening, EZRA BLOUNT, Editor of Products Finishing, who related his experience with Japanese metal finishing industry during his tour of duty with the U. S. Air Force.

a good pattern

for you

to

follow!

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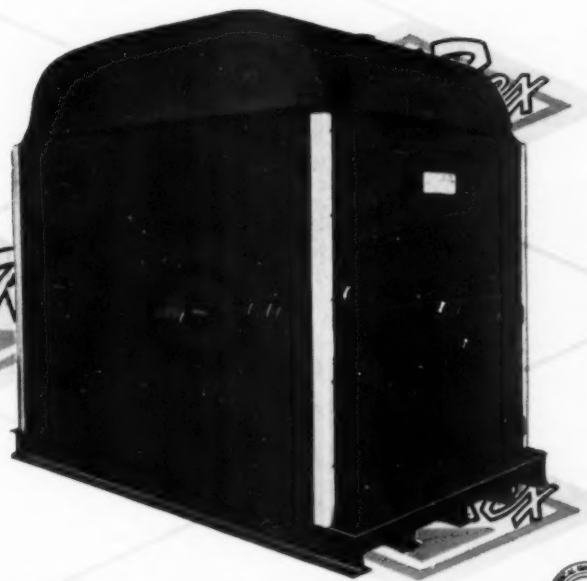
SELENIUM RECTIFIERS



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Such an outstanding record cannot be ignored. Place your plant in the SEL-REX pattern and enjoy uninterrupted service WITHOUT costly maintenance. SEL-REX REACTRONICALLY CONTROLLED RECTIFIERS are sealed against dirt, moisture and corrosive fumes. There are no moving parts to wear out. Literature and names of SEL-REX equipped plants on request.

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SEL-REX RECTIFIERS for every requirement from 25 to 50,000 amperes.

Branch News

He exhibited samples and color slides of plating in Japanese job shops, also meetings of the Japanese Electroplating Society. Blount also showed color movies of famous landmarks and the people of Japan.

Refreshments were provided by Luke Fountain acting as host for Scobell Chemical Corp. of Rochester, N. Y.

The Syracuse Branch held its first sectional meeting for the members in the Albany-Troy-Schenectady area with a dinner meeting at Panetta's in Menands (6 miles north of Albany). With only 15 members in this area, 52 persons attended the dinner and meeting which shows what a great job the committee had done on this meeting.

Syracuse officers present were: Dan Gray, president; Vincent McConnell, vice-president; Lindley Wood, secretary, and George Cavanaugh, of the AES Law Committee. The local committee for this meeting was Ted Infield, Paul Callahan, Norm Searles, Ted Duvall, and Jim Stevens.

Dan Gray opened the meeting as only Dan can do and Ted Infield was elected pro-tem chairman and Jim Stevens pro-tem librarian.

The meeting proceeded with Charles Ostrander of (Iridite) Allied Research Products, Inc., Baltimore, Md., giving an excellent talk on "Chromate Finishes." Ostrander spoke of the many types of chromate treatments including some of the latest on aluminum, magnesium and more recent developments not presented to the finishing trade as yet.

Two movies were shown, "Clean Waters" and "March of Times Civil Defense," the latter starring George Cavanaugh (Col. Cavanaugh) of the Syracuse Branch.

There will be a meeting the first Monday of every month here and there will be a request for a temporary charter shortly.

At the February 15th meeting at Bill Richards Restaurant, 57 members and guests attended with 33 enjoying a pre-meeting meal of prime ribs of beef.

Herb Gerhardt, chairman of the nominating committee, announced the slate to be voted on by the membership. This year there will be 7 on the board of managers instead of 3 and an assistant librarian.

Dan Gray gave the branch membership a report of three meetings, Editorial Board Meeting, Schenectady-Troy-Albany Meeting, and the Interim Meeting at Toronto.

Donald B. Connelly, Electromechanical Division, General Electric Co., Engineering Laboratory, Schenectady, N. Y., was the speaker of the evening. Connelly spoke on "Ultrasonic Cleaning." He showed slides of ultrasonic equipment, also sketched the various phases of its design. The scope of this talk was power ultrasonics in the 20 kc–60 kc range. This process increased the solvent action 100–1 and was used on small or odd parts difficult to clean.

Refreshments were provided by Cowles Chemical Co. of Cleveland, Ohio, George Wolerben acting as host.

Lindley S. Wood, *Secretary*

TOLEDO BRANCH

At a regular meeting held on January 7 at the Park Lane Hotel, Toledo, 16 members attended the dinner prior to the technical session.

The business meeting was opened by President Dettinger at 8:30 P.M. with 18 members present. The applications of Richard Vold, purchasing agent, and Frank Barrett, foreman, both at the Fulton Mfg. Co., Wauseon, Ohio; Charles Ennis, partner, Adrian Rack Co., Adrian, Mich.; Paul Weaver, vice-president, Miner Co., Toledo, were accepted. Complete membership lists were passed out to the members so they might contact those members that are not attending meetings. Gayle Goldsworthy brought up the question of a summer outing for members and their families. After some discussion, the following committee was appointed to study the matter: Ben Gomersall, Al Szymanowski, Sr., Jack Goldsworthy, and Walter Weiker, chairman.

A round table discussion on bright nickel was held. Walter

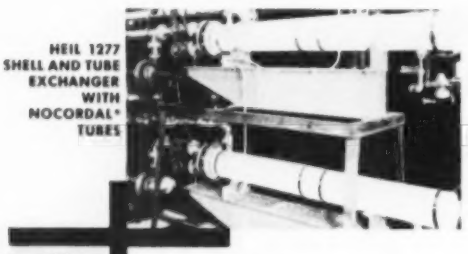
At the February 4th meeting, dinner was attended by 18 members and guests.

President Dettinger opened the business session at 8 P.M.

Victor Miner read a letter received from the Wyandotte Co., Detroit, Mich.,

(*Continued on page 434*)

HERE'S THE ANSWER TO YOUR ACID HEATING OR COOLING PROBLEM



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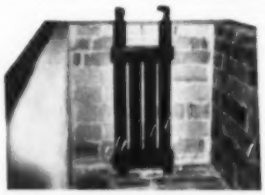

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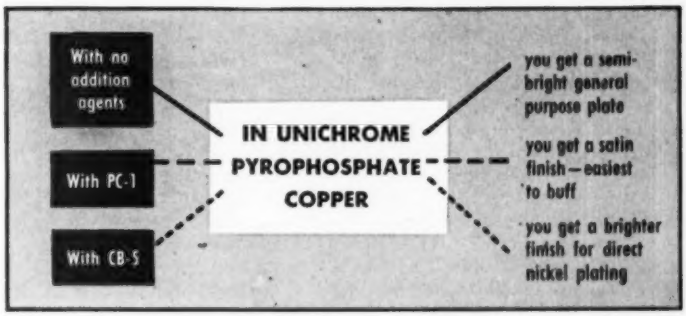
Copper Bath Now Gives Three Finishes


With no addition agents
With PC-1
With CB-5
IN UNICHROME PYROPHOSPHATE COPPER
you get a semi-bright general purpose plate
you get a satin finish—easiest to buff
you get a brighter finish for direct nickel plating

New addition agents for Unichrome Pyrophosphate Copper Plating Solution add extra benefits

AMAZING new versatility has been introduced into the Unichrome Pyrophosphate Copper Process by development of two new addition agents. Now, in addition to the time-tested semi-bright deposit, a still brighter or a satin finish can also be obtained. Platers can now choose a deposit that best fits the work to be plated, and thereby cut costs.

BUFFABILITY INCREASED

One of the new addition agents, Unichrome Compound PC-1, increases plating speed as much as 15 to 20%. The satin deposit it produces hides polishing marks on steel. This dense deposit "flows" under the buffing wheel at lighter pressure. Buffing this copper suffices in many cases, eliminating any need to do the harder buffing on subsequent plates.

BUFFING AVOIDED

Unichrome Compound CB-5, the other agent, serves to brighten the deposit. Producing a more uniform plate overall, it can generally eliminate need for copper buffing prior to plating with bright nickel. Even low current density recesses get increased brightness.

Increased plating speed has also been obtained in installations using this addition agent.

MORE COST CUTTING FEATURES

Whether used with either of the new agents, or simply used alone, the Unichrome Pyrophosphate Copper Process offers certain service-proved advantages that reduce plant operating costs.

As a cyanide-free bath, for example, it minimizes cyanide disposal expenses — which include *materials* to treat the wastes; also the cost of waste-treating *equipment*, the *space* it occupies, and the *labor* to operate and maintain it.

Other features insure simplified operation. It maintains its initial wide current density range. It permits simple, more efficient air agitation. It covers well without difficulty, and it is unusually easy to control. Send for new Bulletin CU-3 which gives more details.

HERE'S ECONOMY IN TEMPERATURE-CONTROL COILS

No common plating room acid, except hydrofluoric, can attack tantalum metal. Unichrome Tantalum Coils, therefore, offer a money-saving means for controlling the temperature of acid solutions such as chromium plating baths. A New England company that installed two of them discovered after only one year that the coils had actually paid for themselves by eliminating both the cost of repair or replacement of former type of coils, and the downtime and loss of production normally experienced.

Many chromium plating difficulties eliminated

Case after case has shown that the Unichrome SRHS Chromium Bath virtually obsoletes the ordinary solution. Here are its chief advantages:

Important chemical constituents of the Unichrome SRHS bath are controlled automatically — maintaining the solution at top plating balance. This has slashed control time and maintained plating quality.

Higher plating speeds have been achieved—with plating time often cut 50% or more, and capacity of existing equipment increased.

This solution's wider bright plate range has reduced "burning" on edges and "missing" in recesses, thereby further cutting rejects.

In hard chromium operations, its greater leveling action has reduced polishing time. Bulletin SRHS-2 gives more information.

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Membership Report of the A E S

Elections

BUFFALO: Willim H. Beck, Charles J. Fadale, Martin J. Holmes, Robert E. Lienert, Salvatore F. Nania, Emil J. Pieper, Kenneth A. Smiley

CHICAGO: Richard C. Hannenberg, John B. Padwojski, F. Allen Powers

DETROIT: Meredith W. Alair, Arthur K. Bissinger, Harry L. Boggus, Henry C. Bornand, James A. Collins, Stanley F. Czajkowski, Harold Gardynik, Martin J. Gardynik, James Y. Harper, John D. Jones, Joseph H. Ketko, Louis R. LeMay, Richard E. Locke, Alex H. Lovasz, G. Louis Lux, Leonard T. Matyniak, Andrew Mehall, Murray Methesen, Edgar T. North, Edward A. Peck, Anthony C. Peters, Richard J. Rajewski, Earl M. Richards, Edward J. Richards, Ernest H. Richard, William H. Schan, Clare R. Schnur, James M. Shortt, Donald R. Sorby, Richard S. Staff, Robert S. Sweeney, Robert B. Untener, Richard J. Walters, James E. Warren, Robert G. White, Frank A. Wisniewski, George A. Wright

GRAND RAPIDS: Roy Baker, John Gifford, Roy T. Romine, Leo B. Wiseman, Robert C. Woodhouse

HARTFORD: Joseph DeFazio

LOS ANGELES: Skip Beery, John Kostura, Reg Morgan, Henry Saklad, Frank Stabile, William J. Wissman

MILWAUKEE: Edward F. Eckert, John C. Wagner

NEWARK: Eugene G. Castellano, Arnold B. Klein, Frank G. Salerno

PROVIDENCE-ATTLEBORO: Sidney Kareemo, Thomas J. Lawrence, William B. Newman

SYRACUSE: Franklin C. Brownell, John H. Green, Raymond N. Gros

TORONTO: Hans Liebmann

WATERBURY: John A. Doyle, Albert Semberski

WESTERN ONTARIO: Robert Cooper, R. Corfield, R. Hale, Edward F. Harris

Reinstatements

ADELAIDE: W. Fisher (Erroneously reported as resigned)

LOS ANGELES: Ernie Bustamante

ROCKFORD: E. Anderson, G. Carlson, F. J. Florin, Chas. S. Kranski, G. J. Lehman, R. C. Sheets, C. J. Wells

SAGINAW VALLEY: Donald J. Schindehette (returned from armed forces)

TORONTO: C. Chesebrough (suspended in error)

Transfers

Irving H. Eastman from Syracuse to Buffalo; David A. Kilmurray to San Francisco from Buffalo; William A. Hopkins to Newark from Detroit; Harold A. Kahler to Hartford from Detroit; Wilmar W. Kaufman from Saginaw Valley to Detroit; Edmund J.

Membership Competition

BRANCH	Membership April 1, 1953*	New Members	Net Change in Membership	Per Cent Net Change	Sustaining Membership Credits*
First Group					
Los Angeles	236	57	+48	+20.3	16
Detroit	504	104	+80½	+16.0	55
Newark	251	30	+24½	+9.8	11
Pittsburgh	142	17	+13	+9.2	6
Hartford	151	20	+13	+8.6	5
New York†	352	44	+29½	+8.4	19
Philadelphia	198	24	+10½	+5.3	11
Waterbury	130	10	+3½	+2.7	16
Cleveland	236	24	+6	+2.5	19
Chicago	477	29	+5	+1.0	85
Milwaukee	164	38	+1	+0.6	8
Melbourne	169	19	+1	+0.6	..
Boston	155	3	−½	−0.3	6
Bridgeport	158	9	−3½	−2.2	4
Grand Rapids	173	17	−4½	−2.6	13
Toronto	146	16	−9	−6.1	7
Second Group					
Syracuse	128	33	+20½	+16.0	4
Dayton	76	13	+10½	+13.8	3
Montreal	80	8	+8	+10.0	1
Indianapolis	105	17	+8	+7.6	1
Saginaw Valley‡	103	19	+7	+6.8	..
St. Joseph Valley	78	12	+3½	+4.5	4
Twin City	71	4	+2½	+3.5	1
Baltimore-Washington	93	13	+3	+3.2	4
San Francisco	74	15	+1½	+2.0	..
Sydney	82	11	+1	+1.2	..
Buffalo	106	13	−½	−0.5	2
Providence-Attleboro	95	6	−2½	−2.6	2
Cincinnati	92	4	−4½	−4.9	2
New Haven	100	..	−6½	−6.5	7
Rochester	107	11	−9	−8.4	3
St. Louis	109	8	−18	−16.5	10
Third Group					
Western Ontario	22	6	+6	+27.3	▲
Rockford	63	13	+13½	+21.4	3
Columbus	52	9	+8½	+16.3	1
Springfield	57	10	+7½	+13.2	2
Hamilton	25	3	+3	+12.0	4
Lancaster	69	4	+4	+5.8	2
Southeastern	50	4	+2	+4.0	1
Adelaide	52	7	+1	+1.9	..
Dallas-Fort Worth	53	6	+1	+1.9	1
Houston	42	1	+½	+1.2	1
Kansas City	46	6	0	0	..
Toledo	56	10	0	0	3
Jackson-Lansing	61	3	−½	−0.8	1
Allentown-Reading	53	..	−4	−7.5	6
Louisville§	44	3	−4½	−10.2	2
Wichita	41	5	−7	−17.1	2
Canadian Branches, unallocated					8
Other credits to be allocated					1
Outside Competition					
Portland	...	18	.....	.....	..
At Large	138	23	+20	.....	...
Total AES	6,065	779	+311½	+5.1	363

Active Membership, February 28, 1954 6,377

*Subject to correction. †,‡,§Winners in first, second and third groups, respectively of 1952–1953 membership competition. ▲ Proper credit to individual Canadian Branches not available.

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Barrel Zinc Brighteners

PROMAT B4, B4M and B8
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Here's a simple, fast and *economical* method for producing brilliant zinc deposits on barrel work.

Promat B4, B4M and B8 Brighteners can be successfully treated with chromates, phosphates and other surface conversion coatings . . . are easily controlled, strike fast, cover well, and can be depended upon for uniform depth and brilliance of color.

. . . and there's more—most average cyanide zinc plating solutions can be readily and inexpensively converted to Promat B4, B4M or B8. Find out how, and why, these new brighteners can help ease your plating problems. Write for details.

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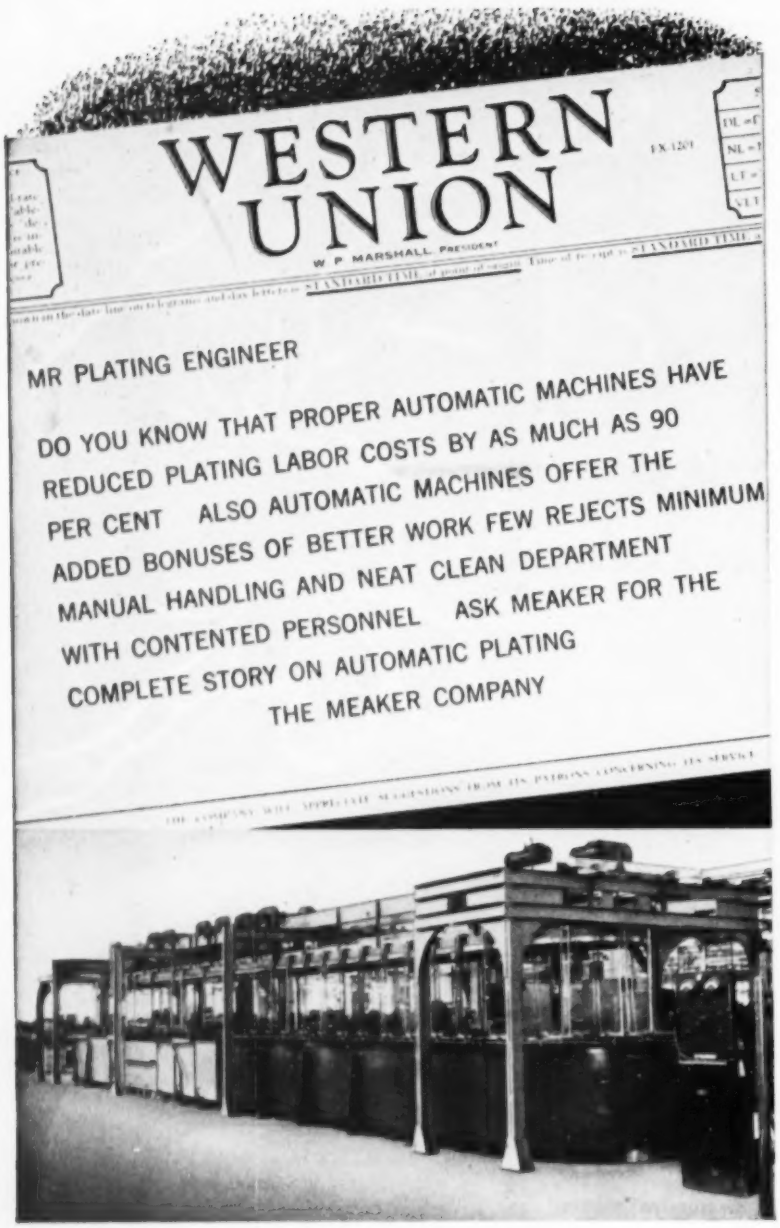
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Resignations

GRAND RAPIDS: Samuel Destefano, David E. Peacock, Edward Soskowski
TORONTO: Victor J. Punter

Suspensions

CHICAGO: K. J. Ackerman, Roger R. Jenness
DETROIT: Roy J. Signorino (inducted into Armed Forces)
GRAND RAPIDS: Max R. Bean, Robert Burdick, Harry Dickson, George Dowsley, Phyllis E. Fowke, J. W. Kaines, Darwin O. Ketchum, Harvey Kroeze, Donald Martin, Herbert W. Richter, Elzy P. Saveywine, Malcolm L. Tomsu, Henry Vander Wal, Edward J. Vogt, Samuel G. Yared
LOUISVILLE: Henry T. Brumleve, Omer E. Burnett
SAGINAW VALLEY: Donald E. Shearer

Deaths

DETROIT: W. R. Shields
GRAND RAPIDS: Frank A. Holloway
MILWAUKEE: James F. Hamilton
WATERBURY: Robert S. Leather

Branch News

(Continued from page 430)

in regard to Toledo Branch visiting the Wyandotte Research Lab on the tentative date in April.

A motion by Ben Gomersall was passed that the Secretary send out questionnaires to all members and find out how many members are interested in the trip.

Announcement was made of the Cincinnati Tri-State Annual Meeting. The chairman appointed the following members on the Nominating Committee: Edward Agnew, Glen Noe, and Al Szymanowski.

Round Table discussion was held on stripping copper, nickel and chromium from cast iron; anodizing aluminum; why the uneven effect of grey and bright lines throughout a flat surface.

Suggested polishing procedure was made: 60-120-180-220 grain then buff, degrease, and color while the part is still hot. Trouble is experienced only with this one particular part. The aluminum had been checked and found to be OK. No definite answer was reached. Door prize was given away. Question came up as to why the National officers do not visit the Branches.

G. H. Bergeman, *Secretary*

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ALLENTOWN-READING meets third Wednesday of each month in Scotty's Anchorage, Second and Main Streets, Emmaus, Pa. Secretary-Treasurer, Norman H. Miller, New Berlinsville, Pa. Research Finance Committee Chairman, Malcolm G. Merkle, c/o General Electric Company, 1801 S. 12th Street, Allentown, Pa.

BALTIMORE-WASHINGTON meets second Tuesday of each month with meetings in Baltimore at the Engineers' Club and in Washington, D. C., at the National Bureau of Standards. Secretary, Carl H. Thiede, 8426 Piney Branch Road, Silver Springs, Md.

BOSTON meets first Thursday of each month in Hotel Statler. Secretary, Dr. George P. Swift, 53 Galen Street, Watertown 72, Mass. Research Finance Committee Chairman, Louis V. Gagnon, 53 High Street, Natick, Mass.

BRIDGEPORT meets second Friday of each month in Barnum Hotel. Secretary-Treasurer, Robert G. Parker, 25 Beverly Road, Trumbull 58, Conn.

BUFFALO meets first Friday of each month in Markeen Hotel. Secretary Eric G. Sampson, Jr., 43 W. Main Street, Falconer, N. Y.

CHICAGO meets second Friday of each month at 6 P. M. at Western Society of Engineers, 84 E. Randolph Street. Sec-

retary-Treasurer, Paul Glab, 882 N. Paulina Street, Chicago 22, Ill. Research Finance Committee Chairman, Charles Geldzahler, c/o Platers' Technical Service, Inc., 509 S. Wabash Avenue, Chicago 9, Ill.

CINCINNATI meets fourth Wednesday of each month at 7:30 P. M. in Engineering Society Headquarters, McMillan Street and Woodburn Avenue. Secretary, William Young, 7124 Montgomery Road, Cincinnati 36, Ohio. Research Finance Committee Chairman, C. R. Sorber, 2004 Connecticut Avenue, Cincinnati 24, Ohio.

CLEVELAND meets first Friday of each month in Hotel Carter at 8 P. M. Secretary-Treasurer, A. J. Lupien, 4408 Carnegie Avenue, Cleveland 3, Ohio. Research Finance Committee Chairman, to be appointed.

COLUMBUS meets first Friday of each month at 8 P. M. in Battelle Memorial Institute Auditorium. Secretary-Treasurer, Harry L. Moore, 505 King Avenue, Columbus 1, Ohio. Research Finance Committee Chairman, to be appointed.

DALLAS-FORT WORTH: Secretary-Treasurer, A. C. Fricke, 212 Julien Street, Dallas 8, Texas.

DAYTON meets second Wednesday of each month in the Biltmore. Secretary, John Easton, 641 Fairachers Drive, Dayton 9, Ohio. Research Finance Committee Chairman, Richard F. Moore, 526 Aberdeen Ave., Apt. B, Dayton 9, Ohio.

DETROIT meets first Friday of each month in Hotel Statler. Secretary-Treasurer, R. J. Racine, c/o Wyandotte Chemicals Corporation, Wyandotte, Mich. Research Finance Committee Chairman, L. M. Morse, c/o Chrysler Corp., Detroit, Mich.

GRAND RAPIDS meets second Friday of each month at Fingers Restaurant at 7 P. M. for dinner; educational session at 8:15. Secretary, John Dykstra, 720 Delaware, S. E., Grand Rapids, Mich.

HAMILTON BRANCH meets third Thursday of each month in the Conference Room, West End Plant, Canadian Westinghouse Company, Ltd. Secretary, R. Burke, c/o Swift Devices, 14 George Street, Hamilton, Ontario, Canada.

HARTFORD meets third Monday of each month in Hotel Bond at 7:45 P. M. Secretary, Stanley Platoz, 26 Erwin Place, New Britain, Conn. Research Finance Committee Chairman, Frank W. Smith, 46 Cottage Street, Meriden, Conn.

HOUSTON meets third Tuesday of each month at 6:30 P. M in the Ben Milam Hotel, Houston, Texas. Secretary-Treasurer, Forest Baskett, 1240 Overhill, Houston, Texas.

INDIANAPOLIS meets first Wednesday of each month at Fox Steak House, 1207 E. Washington Street. Secretary, Miss Edna Rohrabaugh, 816 Robert Street, Lafayette, Ind.

JACKSON-LANSING meets second Tuesday of each month alternating between Meadow Lark Inn in Jackson and Porter Hotel in Lansing. Secretary-Treasurer, E. J. Bosca, 411 Third Street, Jackson, Mich. Research Finance Committee Chairman, H. McKlueen, 3617 McCain Road, Jackson, Mich.

KANSAS CITY—Secretary-Treasurer, Olin K. Bock, 5317 W. 58th Street, Mission, Kansas.

LANCASTER meets second Friday of each month at 8 P. M. September, December and April meetings are held at Hanover, York and Harrisburg, respectively; all other meetings at the Old Mill Inn, Lancaster, Pa. Secretary-Treasurer, Harry A. Saylor, 40 N. Poplar Street, Elizabethtown, Pa. Research Finance Committee Chairman, Harry Hovis, Lincoln Highway, West Lancaster, Pa.

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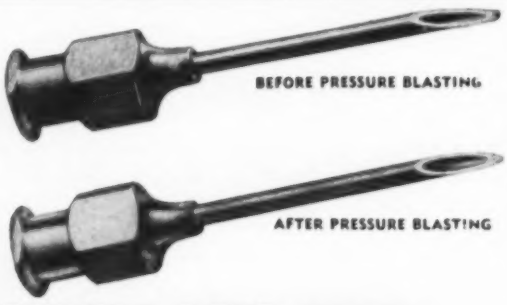

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LOUISVILLE meets third Thursday of each month in Room 119, Speed Scientific Building, University of Louisville. Secretary-Treasurer, Joseph G. Sterling, 1169 Keller Avenue, Louisville, Ky. Research Finance Committee Chairman, T. K. Allison, 2502 Manchester Rd., Louisville 5, Ky.

MELBOURNE, AUSTRALIA meets third Thursday of each month at 8 P. M. in Metallurgy Theatre, Melbourne Technical College, 124 Latrobe Street. Honorary Secretary-Treasurer, S. B. Pearce, 11 Waterloo Street, Carlton, Melbourne, Australia.

MILWAUKEE meets first Friday of each month in the East Room, Hotel Ambassador. Secretary-Treasurer, E. E. Piellusch, 2921 S. 90th Street, West Allis 14, Wisc. Research Finance Committee Chairman, to be appointed.

MONTREAL meets first Tuesday of each month in Mount Royal Hotel. Secretary, J. T. Reisenburg, Jr., 996 Debullion Street, Montreal, P. Q., Canada. Research Finance Committee Chairman, P. M. Coady, c/o Alloycraft, Ltd., 27 Hillside Avenue, Westmount, Montreal 6, P. Q., Canada.

NEWARK meets third Friday of each month at 8 P. M. in Hotel Robert Treat. Secretary-Treasurer, George Wagner, Hy-Grade Electro Plating Company, 35 Fourth Street, Newark, N. J. Research Finance Committee Chairman, John Gumm, 538 Forest Street, Kearny, N. J.

NEW HAVEN meets second Tuesday of each month alternating between Sterling Chemistry Laboratory, Yale University, and Hotel Taft. Secretary-Treasurer, B. J. Gaffney, 40 Filbert Street, Hamden 14, Conn. Research Finance Committee Chairman, Dr. H. L. Kellner, c/o Lea Manufacturing Company, 16 Cherry Avenue, Waterbury 86, Conn.

NEW YORK meets second and fourth Fridays of each month in the Statler Hotel. Secretary-Treasurer, George Schore, 150 Bennett Avenue, New York 33, N. Y. Research Finance Committee Chairman, Milton Nadel, 41-15 50th Avenue, Long Island City 4, N. Y.

PHILADELPHIA meets fourth Friday of each month. Meetings are held at the Broadwood Hotel, Franklin Institute or the Engineers' Club. Secretary, I. William Marcovitch, 1302 St. Vincent Street, Philadelphia 11, Pa. Research Finance Committee Chairman to be appointed.

PITTSBURGH meets first Wednesday of each month in the Avon Room of the Sheraton Hotel. Secretary, Wm. D. Wilson, 1167 Varner Road, Pittsburgh 27, Pa. Research Finance Committee Chairman, S. S. Johnston, c/o Weirton Steel Company, Weirton, W. Va.

PORTLAND. Secretary, K. B. Humphrey, 936 N. E. Floral Place, Portland 31, Oregon.

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SYRACUSE meets third Monday of each month in Richard's Restaurant. Secretary, Lindley Wood, 1329 Bellevue Avenue, Syracuse 4, N. Y. Research Finance Committee Chairman, George W. Cavanaugh, 129 Kenwood Avenue, Syracuse 8, N. Y.

TOLEDO meets first Thursday of each month at Park Lane Hotel. Secretary, Gaston Bergeman, 703 Pine Street, Fremont, Ohio.

TORONTO meets second Friday of each month in Royal York Hotel. Secretary, Robert L. Edwards, 1106 Dovercourt Road, Toronto, Ont., Canada. Research Finance Committee Chairman, K. Wells, 370 Victoria Avenue, Toronto, Ont., Canada.

TWIN CITY meets first Monday of each month, October through June, in the Covered Wagon (Lodge Room), 114 S. 4th Street, Minneapolis, Minn., with dinner at 6:30 P. M. and business and technical session at 8:00 P. M. Secretary-Treasurer, Robert L. Buckley, c/o Industrial Chemical & Equipment Company, 205 11th Avenue So., Minneapolis 15, Minn. Research Finance Committee Chairman, to be appointed.

WATERBURY meets second Thursday of each month in Elton Hotel. Dinner, 6:30 P. M.; meeting, 8 P. M. Secretary-Treasurer, Spencer L. Henn, P. O. Box, Drawer B, Cheshire, Conn.

WESTERN ONTARIO meets third Friday of each month in William Pitt Hotel, Chatham, Ontario. Secretary-Treasurer, K. W. Farquhar, 54 Napier Street, Ltd., Wallaceburg, Ontario, Canada.

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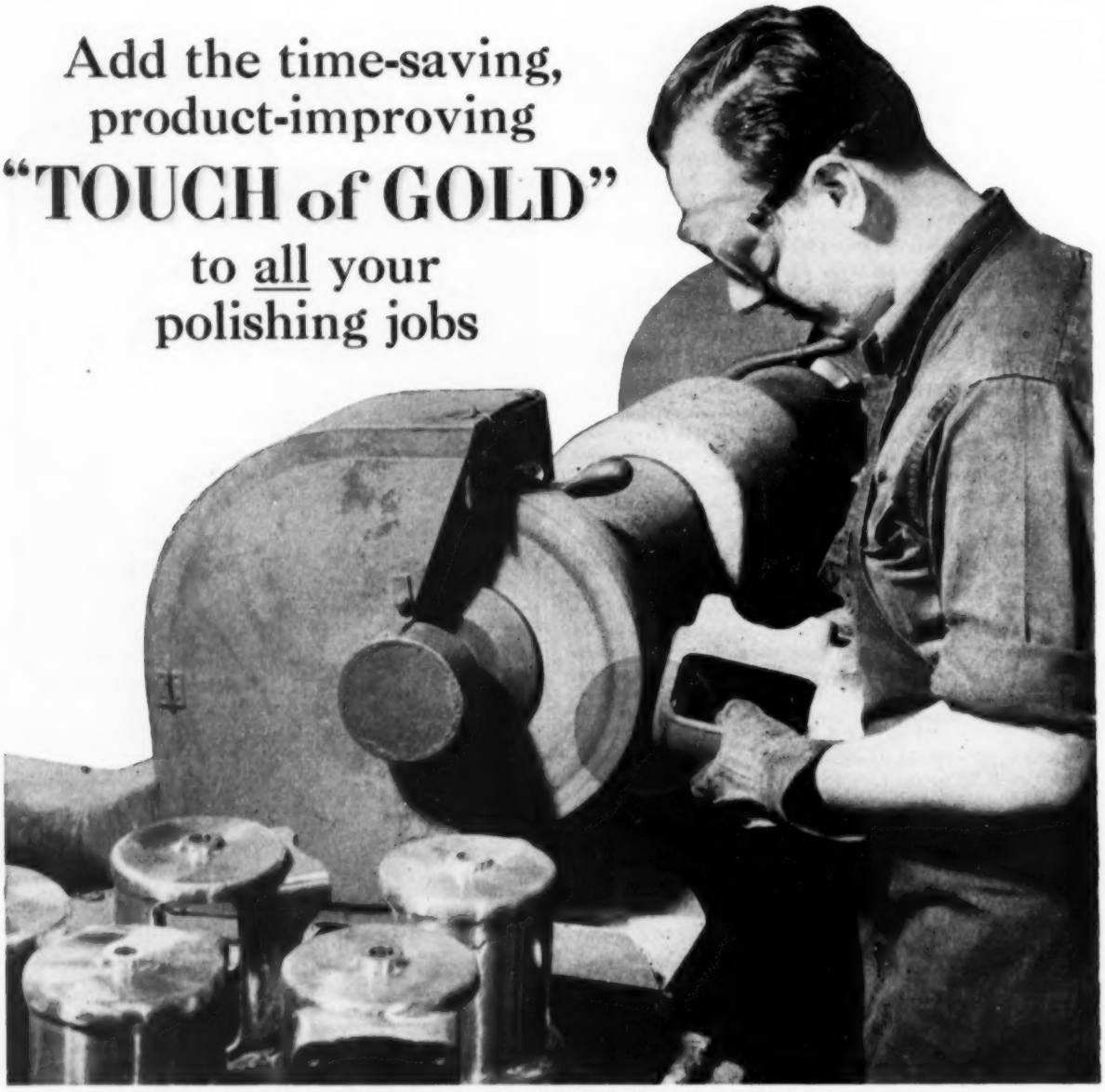

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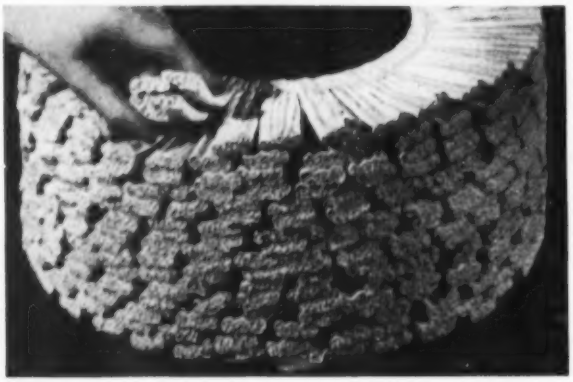

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FASTER cutting action that's positively unbelievable!
This #20-RD is proving to be the fastest-cutting buff ever developed, because only the raw ends of each sisal fibre are in contact with the work, and they pick up and *retain* the cutting compound better.

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Many foremen have found the wearing qualities of the #20-RD to be unmatched by any other buff they have ever used. It is manufactured with first-quality sisal twine only, especially processed and tightly twisted to eliminate fraying.

REMARKABLY smoother finish now possible!
Due to the exclusive use of imported combed sisal, the #20-RD produces a smoother finish that is not possible with ordinary sisal buffs.

FLEXIBILITY never before achieved in a sisal buff!
In addition to the flexibility of each buff finger, the complete freedom of the sisal fibres within each finger gives the utmost in flexibility. With no spiral sewing, the CHURCHILL #20-RD is ideal for work involving curved surfaces and recesses.

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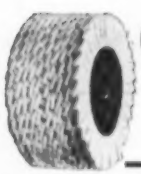

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BOSTON BRANCH, AES. 18th Annual Educational Session and Dinner-Dance at the Statler Hotel on Saturday, May 1, 1954.

TORONTO BRANCH AES sponsoring the Canadian Annual Regional Convention at the Brock Hotel, Niagara Falls, Ontario, Canada, on Saturday, May 1, 1954.

AES BUDGET COMMITTEE Meeting at Headquarters, Newark, N. J., on May 7, 1954.

AES EXECUTIVE BOARD at Hotel Statler, New York, N. Y., on May 8-9, 1954.

HARTFORD, NEW HAVEN, SPRINGFIELD and WATERBURY BRANCHES, AES sponsoring the 15th Annual New England Regional Meeting at the Hotel Bond, Hartford, Conn., on Saturday, May 15, 1954.

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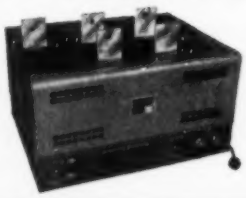

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LEA newsreel

APRIL 1954

THE LEA METHOD OF FINISHING

The Lea Manufacturing Company pioneered and continues to specialize in the development of CLEAN-WORKING polishing and buffing compositions. These special methods minimize cleaning by employing selected grades of LEA COMPOUND, LEAROK, or other special compositions which virtually eliminate excessive cleaning or hand-scrubbing common with regular heavy grease compounds.

Here are some typical case studies of Lea Methods.

CASE STUDY #1

Material: Sterling silver.

Article: Table flatware.

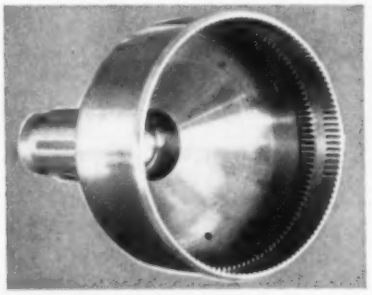
Method of Forming: Customary for this type of work.

Final Finish: Bright Butler.

Lea Method:

1. Cut-down buffing with Tripoli.
2. Cleaning.
3. Lea Compound Grade A-1 or 5023 on a 6" diameter loose muslin buff at 4400 r.p.m.

Remarks: The Lea Method produces a more pleasing finish in about half the time than that produced by any wet method. When a more pronounced Butler finish is desired, a packed buff with Grade A-63 Lea Compound is used.



CASE STUDY #2

Material: Steel.

Article: Bearings, motor parts and other aircraft engine parts, some with counter-sunk holes.

Method of Forming: Forging.

Final Finish: Smooth with burrs removed and slight radius provided.

Lea Method:

Lea Compound Grades "L," "B" or "C" at 5500 surface feet per minute on various types of buffs, string brushes, leather bobs, etc., depending upon the shape of the piece and the accessibility of the surface to be abraded.

Remarks: Work of this type had previously been done by hand with files, emery cloth or burring tools. Lea Compound removes all metal marks and burrs much faster and more economically than hand work. Tolerances are protected by the flexibility of the Lea Compound wheel.

CASE STUDY #3

Material: Brass and bronze.

Article: Bookends and novelties.

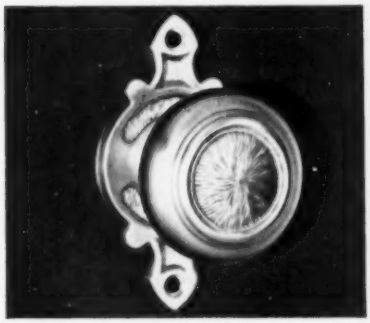
Method of Forming: Casting.

Final Finish: Brushed effect.

Lea Method:

1. Lea Compound Grade "C" on 8" loose wheel at 1500 to 2000 r.p.m.
2. Lacquering.

Remarks: Lea Compound is especially applicable to this type of work as there are numerous recesses in which buffing dirt would lodge with the older method using Tripoli buffing and wet scratch brushing. Accordingly, costly hand cleaning is thereby eliminated.



CASE STUDY #4

Material: Brass.

Article: Door knobs and escutcheon plates.

Method of Forming: Stamping.

Final Finish: Oxidized and relieved.

Lea Method:

1. Cut-down buffing with Tripoli of surface previously polished.
2. Clean.
3. Oxidized in liquid sulphur.
4. Lea Compound Grade "FG" on a 12" diameter loose muslin buff at 1200 r.p.m.
5. Lacquering.

Remarks: Grade "FG" Lea Compound gives a medium butler relieving which requires no cleaning or drying before lacquering.

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